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Estimating

Introduction

In accordance with the requirements of the State Contract Act, the State Highway Engineer must prepare “full, complete, and accurate plans and specifications and estimates of cost” before entering into any contract. This estimate, known as the “Engineers Estimate” (also called Blue Sheet Estimate), lists the total quantity and estimated price for each item and is used as a basis for requesting authority to advertise a project. After bids are received, it is used as a basis for determining the reasonableness of the bids.

The Bridge Cost Estimates Section of the Office of Structure Design provides the item costs for the Engineers Estimate for all bridge and highway related structures designed by the Office of Structure Design. This cost estimate data, which, along with the special provisions and contract plans, make up the Structure’s portion of the PS&E package. The Structure’s PS&E package is sent to the District Office Engineer for use in preparing the Engineers Estimate for the complete project.

BEES (Basic Engineering Estimate System)

The bridge portion of the Engineers Estimate is entered into BEES by the Bridge Cost Estimates Section. BEES is a computer program used for storing estimated quantities and prices for each item of the project. The bridge portion of the estimate is placed in the B (bridge) file and the Districts enter their portion of the estimate in the H (highway) file. The BEES computer program can then generate the C (combined) estimate for the entire project.

BEES has the capability of segregating estimates by structure, alternative designs, etc. BEES is a subsystem of the Project Information System and Analysis (PISA) and utilizes the information contained in the Project Management Control System (PMCS) and the Standardized Item List. The estimate data is available for bid opening purposes and for contract progress payments.

General

In addition to the Engineers Estimate, the Bridge Cost Estimates Section has the responsibility for furnishing several other kinds of estimates for structures during the planning and design stages. These estimates, which are needed for planning and budgeting purposes, include Planning, General Plan, and Marginal Estimates.

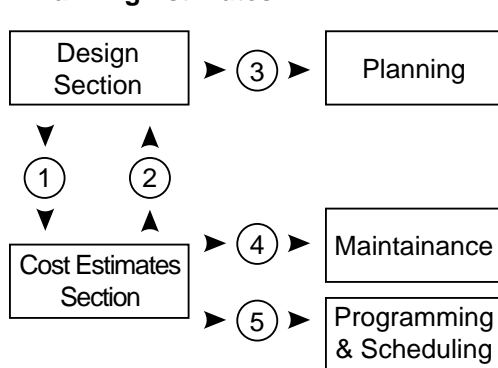
Workflow

The workflow for each of these estimates is as follows:



Estimate Flow Charts

Planning Estimates *



① Advance Planning Study drawing. Include quantity calculations and Planning Estimate form for unusual structures.

** ② Original and 3 prints of drawing. Cost is shown on drawing.

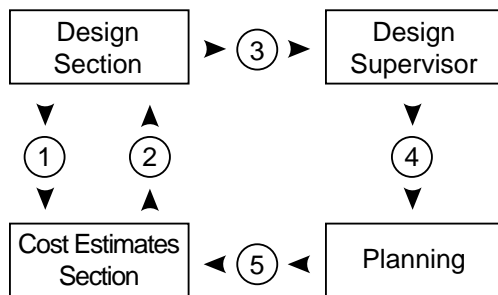
** ③ Original and 2 prints of drawing.

④ 1 print for widenings and modifications.

⑤ Replace, widening or modify-1 print.

**Three additional prints for FHWA for structures with 125,000 or more square feet of deck area

General Plan Estimates *

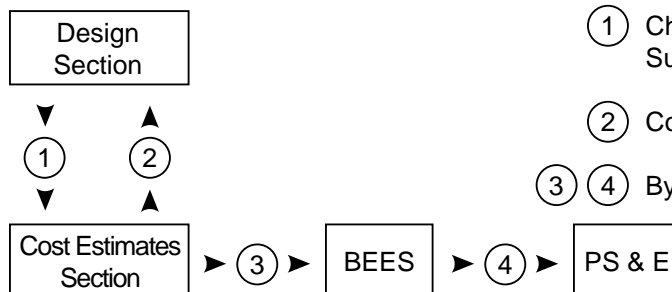


① General Plan Estimate form, calculations and 2 prints of General Plan.

② General Plan Estimate form with cost, calculations and 1 print of General Plan.

③ ④ ⑤ General Plan Estimate form with cost and required number of prints of General Plan.

Marginal (Blue Sheet) Estimates



① Checked plans, Marginal Estimate form(s), Quantity Summary Sheets, and calculations.

② Copy of Structure's Engineers Estimate

③ ④ By Cost Estimates Section to District

* Design Section sends print to Technical Committee if appropriate



Revised Estimates

It is the responsibility of the Design Section Leader and Project Engineer to advise all interested parties as successive estimates are made during the development of a project.

Submittal and Retention of Quantity Calculations

Quantity calculations are to be submitted to the Cost Estimates Section along with Estimate Summary sheets. Calculations for Marginal (Blue Sheet) Estimates are retained in the Cost Estimates Section until the contract is awarded, at which time they are forwarded to the RE Pending File for the Structure Rep's use during the course of construction.

Escalation Factor

Structure estimates are prepared on the basis of prices which are valid on the day the estimate is made. As part of their procedure in developing their planning program, the Districts periodically apply an escalation factor, according to the cost index, to these estimates as necessary to cover inflation.

Mobilization Factor

Structure estimates generally include an item for mobilization. The value of this item is estimated at 10% of the total cost of bid items. If a particular kind or size of a project does not require a separate item for mobilization, the unit price for one (or more) of the major items of work is inflated to cover the contractors cost for mobilization.

Contingency Factors

A contingency factor is added to all estimates to cover the costs of unforeseen design changes and the uncertainty of early quantity estimates.

Planning Estimates	25% Contingency
General Plan Estimates	20% Contingency
Marginal Estimate – Final PS&E	5% Contingency

Stage Construction

It is sometimes necessary to build a bridge in stages. The most common case is replacing a bridge on existing alignment. This will increase the cost about 25% and the construction time about 75%. The plans must show the width of each stage and indicate how traffic is to be handled.



Traffic Control

This item of work is defined and estimated by the Districts. However, it is important that the bridge designer understands how traffic will affect the work and relay this information to the Cost Estimates Section either verbally or by notes on the plans or estimate. Usual situations are “Work 9 AM – 3 PM only” or “All work at night or on weekends.” This and other items concerning work in traffic should be discussed with the District Project Engineer at an early stage. More expensive types of work that can be done quickly without traffic control may be justified by the saving in traffic control costs.

Working Days

The Cost Estimates Section determines the number of working days necessary to construct the bridge portion of the contract work.

Historical Cost Record

This form is to be used by the Project Engineer to maintain a cost record for all structures in the design phase. It is designed for multi-structure projects, but can also be used for individual structures. The Project Engineer is usually the only one familiar with the reason for revisions and related cost changes. Explain these on the back of the form. A copy of the Historical Cost Record form (DS-D0001) is included in the Appendix of this chapter.

Design Section Leaders are responsible for assuring that the cost record and the Status agree.

Cost changes that are a result of price changes made by the Cost Estimates Section are also to be recorded.

Planning Estimates (Advance Planning Studies)

These preliminary estimates are usually based on District geometrics and are used to determine the overall project cost for budgeting purposes. Design prepares a drawing of the structure, called an Advanced Planning Study, showing all significant details that would affect the cost. (See Memo to Designers 1-8.)

For usual or normal types of new bridge structures, the Cost Estimates Section will determine the quantities using their file of square foot factors.

For unusual structures where square foot factors data is not available, such as retaining walls, seismic retrofit, barrier replacements, sliver widenings of less than 15 foot width, deck rehabilitation, or in cases where a close comparison of costs of several different types of structures is required, Design computes preliminary quantities using any of the aids found in this chapter and submits them along with a completed Bridge Planning Estimate form (DS - D0016) and plan to the Bridge Cost Estimates Section.



Advance Planning Study – Usual Case



Advance Planning Study – Unusual Case



Advance Planning Study – Unusual Case

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

BRIDGE GENERAL PLAN ESTIMATE ☐ **OR PLANNING ESTIMATE** ☒

DS-D-0016 (REV. 5/93)

STRUCTURE Gibson Canyon Creek	BR. NO. 23-12L	RCVD. BY D. Valls	ESTIMATING GROUP	
TYPE RC Slab	DIST. 10	CO. Sol	RTE. 80	P.M. 31.1
			IN	3/16/93
			OUT	3/17/93

LENGTH 89.75 × WIDTH 6.75 = AREA 606 SQ FTDESIGN SECTION 12 QUANTITIES BY B. Rayless DATE 3/3/93 ESTIMATE NO. 1PROJECT INCLUDES 1 STRUCTURE(S) QUANTITIES CHCKD. BY _____ DATE _____ PRICED BY JKOAND \$ _____ ROADWORK CHARGE UNIT AND EA 10-39180K COST INDEX 187

CONTRACT ITEMS		UNIT	QUANTITY	PRICE	AMOUNT
1	TEMPORARY RAILING (TYPE K)	LF	240	15	3,600
2	REMOVE CONCRETE – Wingwall	CY	2	250	500
3	STRUCTURE EXCAVATION (BRIDGE)	CY	17	80	1,360
4	STRUCTURE EXCAVATION (TYPE D)	CY			
5	STRUCTURE BACKFILL (BRIDGE)	CY	6	100	600
6	PERVIOUS BACKFILL MATERIAL	CY	3	100	300
7	CIDH CONCRETE PILING	LF			
8	FURNISH PILING	LF	288	12	3,456
9	DRIVE PILING	EA	6	2,000	12,000
10	PC/PS CONCRETE GIRDERS (FEET)	EA			
11	ERECT PC/PS CONCRETE GRIDERS	EA			
12	STRUCTURAL CONCRETE BRIDGE	CY	40	575	23,000
13	STRUCTURAL CONCRETE BRIDGE FOOTING	CY			
14	STRUCTURAL CONCRETE APPROACH SLAB (TYPE)	CY			
15	BAR REINFORCING STEEL (BRIDGE)	LBS	9,000	0.55	4,950
16	PRESTRESSING STEEL	LBS			
17	STRUCTURAL STEEL (INCL PAINT)	LBS			
18	SLOPE PAVING	CY			
19	JOINT SEAL (TYPE)	LF			
20	JOINT SEAL ASSEMBLY (MR =)	LF			
21	CONCRETE BARRIER (TYPE 25)	LF	110	50	5,500
22	Remove Existing Type 2 Rail	LF	110	35	3,850
23	Refinish Bridge Deck	SQ FT	270	15	4,050
24	Drill and Bond Dowels	LF	51	20	1,020

ROUTING

1. DESIGN SECTION _____

2. DESIGN A SUPERVISOR _____

3. DESIGN B SUPERVISOR _____

4. PLANNING _____

ESTIMATING – LAST

DS 93 0043

SUBTOTAL	\$ 64,186
MOBILIZATION (10 %)	6,419
SUBTOTAL STRUCTURE ITEMS	\$ 70,605
CONTINGENCIES (25 %)	17,651
BRIDGE TOTAL (\$145.64 /SQ FT)	\$ 88,256
BRIDGE REMOVAL (CONTINGS INCL)	
WORK BY RAILROAD OR UTILITY FORCES	
GRAND TOTAL	\$ 88,256
FOR BUDGET PURPOSES – USE	\$ 89,000

COMMENTS _____



General Plan Estimates

When the District develops the precise alignment, it submits the bridge site data to Preliminary Investigations. The bridge site data is incorporated into the Preliminary Report which is ultimately forwarded to Bridge Design. Bridge Design chooses the most feasible and usually the most economical type of structure to fit the conditions described in the Preliminary Report and then develops a General Plan. The structure depicted in the General Plan may be different from the structure used for the Planning Estimate.

From the General Plan an estimate of cost is determined by the Cost Estimates Section from quantities calculated by the Design Section.

The preparation of quantities for General Plan Estimates requires a rapid but close approximation of the final quantities for the job. All items which are a part of the cost of the bridge should be included in the estimate. Estimates which are fairly accurate and require a minimal amount of time are preferable to detailed estimates at this stage.

In preparing the quantities, the estimator utilizes the graphs and tables prepared for this purpose, similar jobs, or computations based on dimensions from the preliminary design.

The following forms are available for General Plan Estimates (headings shown only) . An example copy of each form is included in the Appendix of this chapter.

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

BRIDGE GENERAL PLAN ESTIMATE ☐ **OR PLANNING ESTIMATE** ☐

DS-D0016 (REV. 5/93)

STRUCTURE	BR. NO.	RCVD BY	ESTIMATING GROUP	
TYPE	DISTRICT	CO	RTE	PM
			IN	
			OUT	
LENGTH _____ × WIDTH _____ = AREA _____ SF				

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

MISCELLANEOUS BRIDGE GENERAL PLAN ESTIMATE ☐ **OR PLANNING ESTIMATE** ☐

DS-D0017 (REV. 5/93)

STRUCTURE	BR. NO.	RCVD BY	ESTIMATING GROUP	
TYPE	DISTRICT	CO	RTE	PM
			IN	
			OUT	
LENGTH _____ × WIDTH _____ = AREA _____ SF				



Bar Reinforcement /CY of Concrete for Various Bridge Parts

The following are approximate quantities of Bar Reinforcement per cubic yard of concrete. Use for Planning and General Plan Estimates only.

Deck slab on prestressed or steel girders	225 lbs/cy
Bent Caps	150 lbs/cy
Single column bents	450 lbs/cy (285-545 variation)
Multiple column bents	225 lbs/cy (95-350 variation)
Piers and walls of simulated closed end abutments	80 lbs/cy
Footings	150-200 lbs/cy
End diaphragm abutments	80 lbs/cy
Cantilever and strutted abutments	Design Charts
Retaining walls	Standard Plans
Seat Type Abutments	
Skews < 15°	90 lbs/cy
Skews 15° to 45°	100 - 140 lbs/cy

Bar Reinforcement/Ft² of Deck Area

Cast-In-Place Reinforced Slab	13 lbs/Ft ²
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Note: See “Sources of Quantities for Standard Details” shown on page 11-49.

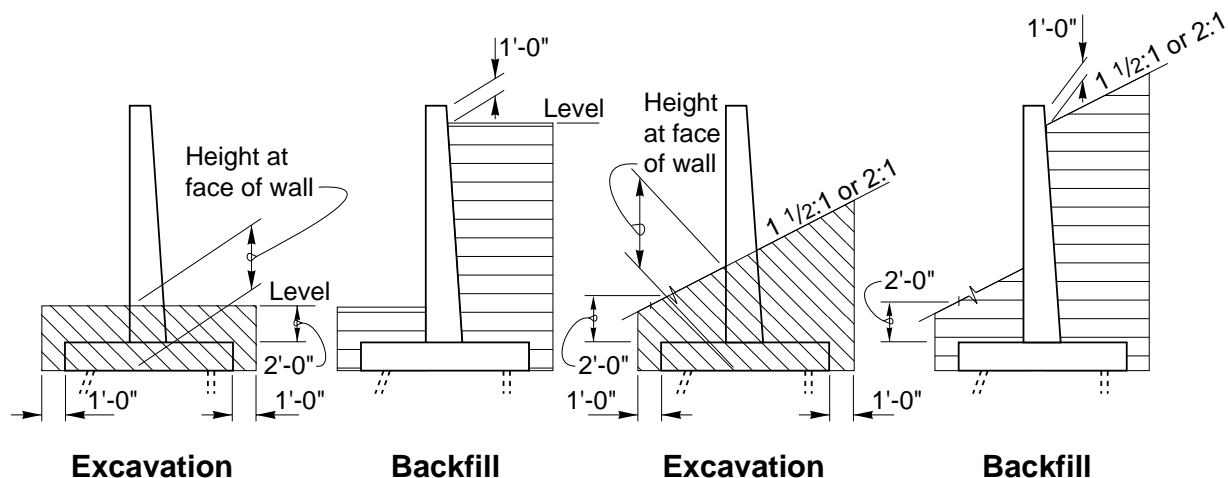


Type 1 Retaining Wall Excavation and Backfill Quantities

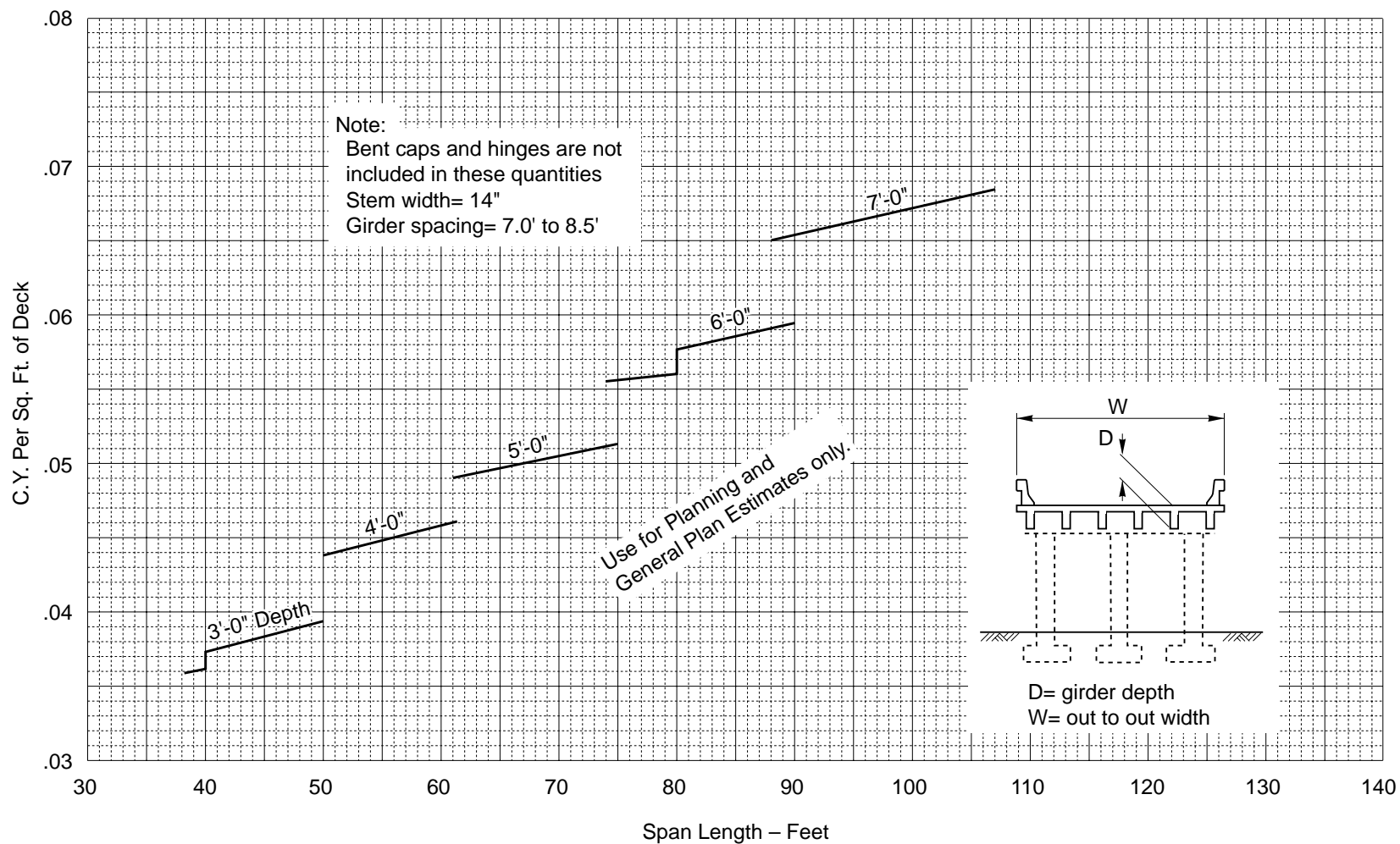
Per linear foot in cubic yards

Use for Planning and General Plan Estimates only

H	Level			1 1/2 : 1			2 : 1		
	Height at Face	Excav	Backfill	Height at Face	Excav	Backfill	Height at Face	Excav	Backfill
4	3.4'	0.9	0.8	4.3'	1.2	0.8	4.1'	1.3	0.8
6	3.4'	0.9	0.9	4.3'	1.2	1.0	4.1'	1.3	1.0
8	3.4'	1.0	1.3	4.5'	1.6	1.5	4.3'	1.4	1.5
10	3.4'	1.2	1.8	4.8'	1.9	2.2	4.4'	1.7	2.0
12	3.4'	1.3	2.5	5.0'	2.2	2.7	4.6'	1.9	2.7
14	3.5'	1.5	3.1	5.3'	2.5	3.6	4.8'	2.2	3.4
16	3.5'	1.6	3.8	5.5'	2.9	4.4	5.0'	2.5	4.3
18	3.6'	1.8	4.7	5.8'	3.3	5.3	5.3'	3.0	5.2
20	3.6'	2.0	5.7	6.0'	3.8	6.4	5.5'	3.4	6.2
22	3.8'	2.3	6.8	6.4'	4.3	7.7	5.8'	3.7	7.5
24	3.9'	2.5	7.9	6.9'	5.0	9.1	6.1'	4.4	8.8
26	4.2'	2.8	9.1	7.3'	5.7	10.6	6.5'	5.0	10.1
28	4.4'	3.1	10.4	7.8'	6.4	11.9	7.0'	5.6	11.6
30	4.6'	3.5	12.1	8.2'	7.4	14.1	7.3'	6.4	13.6
32	5.4'	4.4	14.0	9.3'	9.0	16.3	8.4'	7.9	15.7
34	5.8'	5.0	15.6	10.0'	10.1	18.1	9.0'	8.8	17.9
36	6.2'	5.5	17.3	10.6'	11.1	20.0	9.5'	9.7	19.3



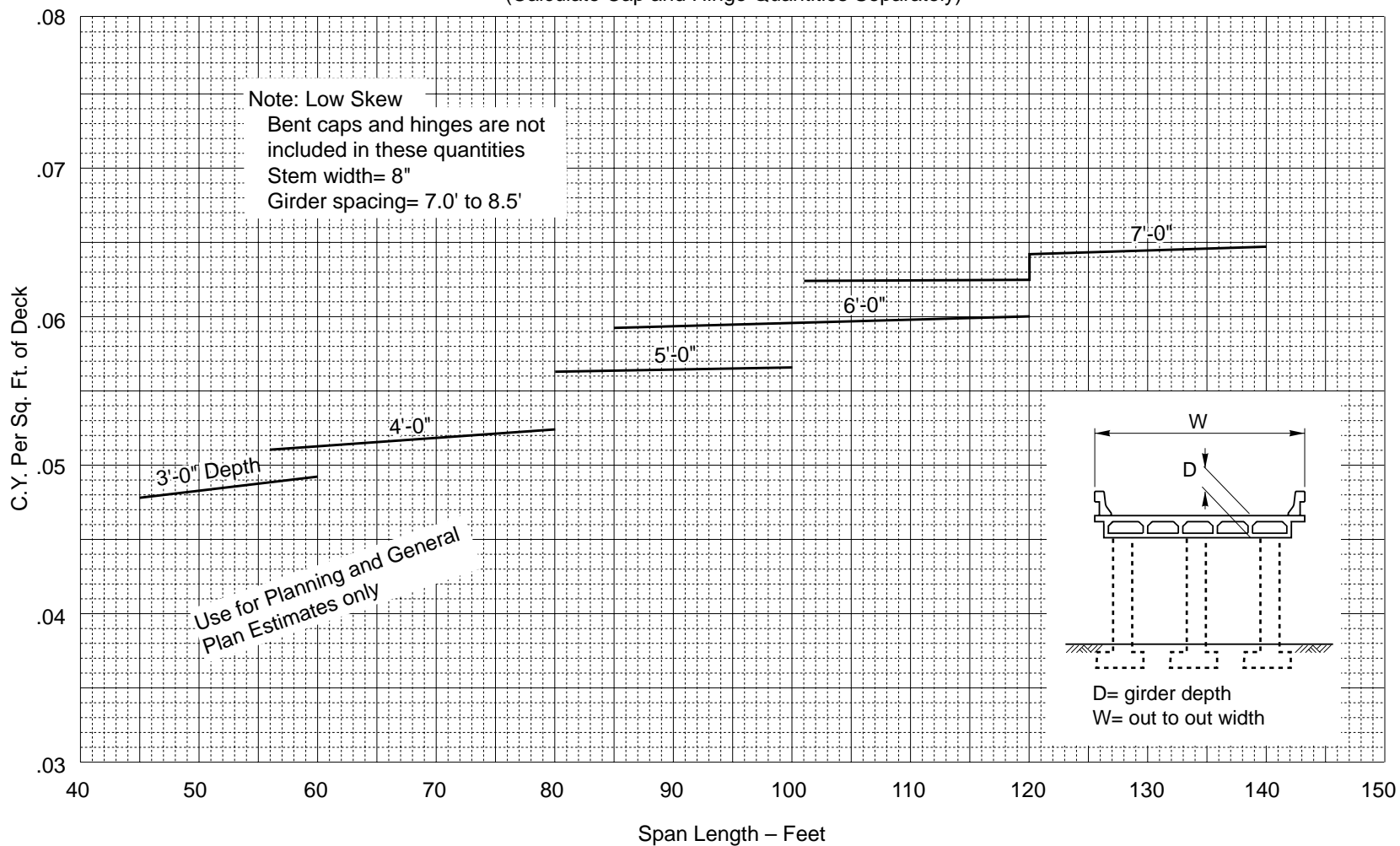
Preliminary Quantity Survey
Girders, Deck and Diaphragms Only
(Calculate cap and hinge quantities separately)



Continuous Tee-Beam Superstructure Concrete

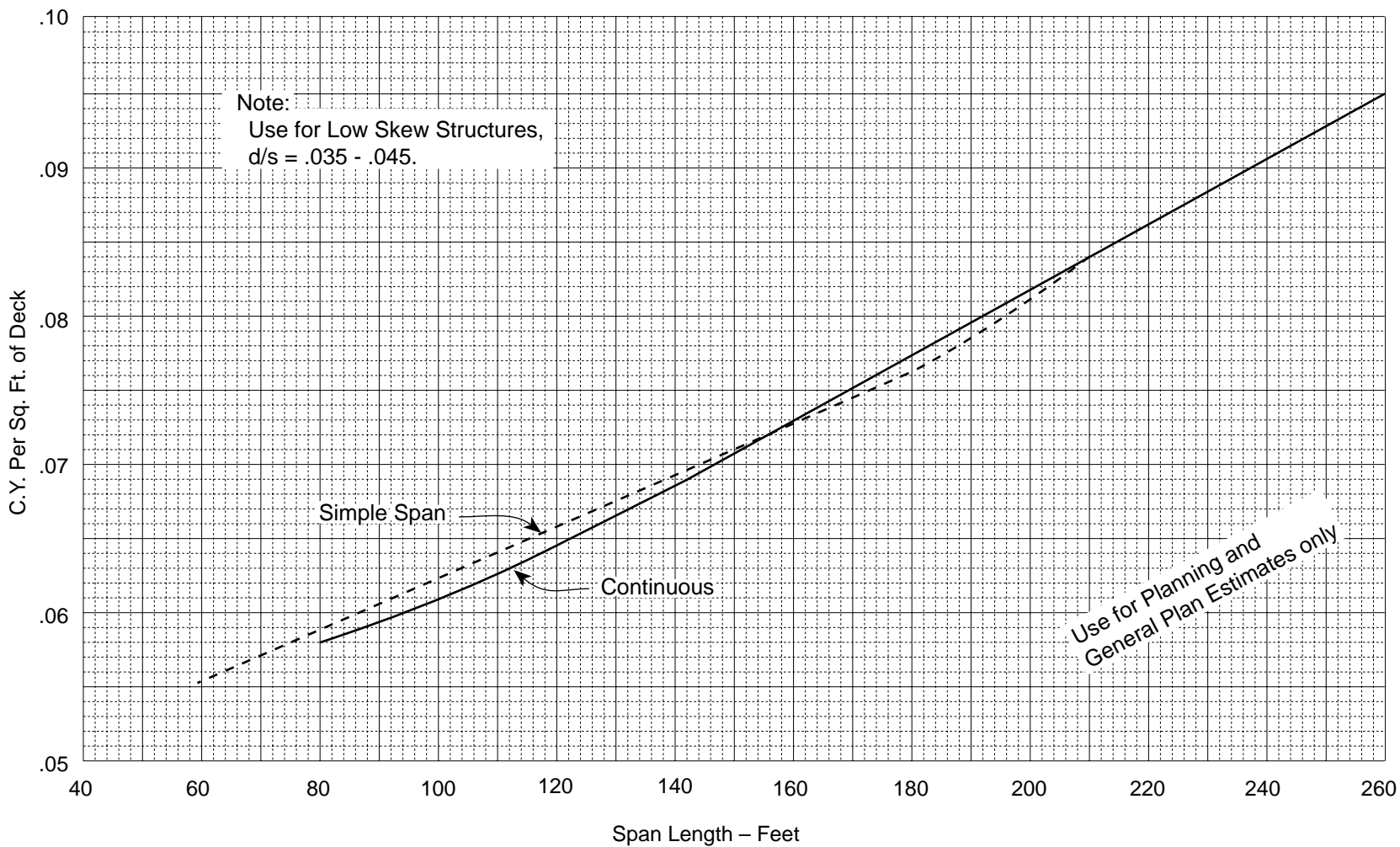


Preliminary Quantity Survey Girders and Slabs Only (Calculate Cap and Hinge Quantities Separately)



Continuous Reinforced Box Girder Superstructure Concrete



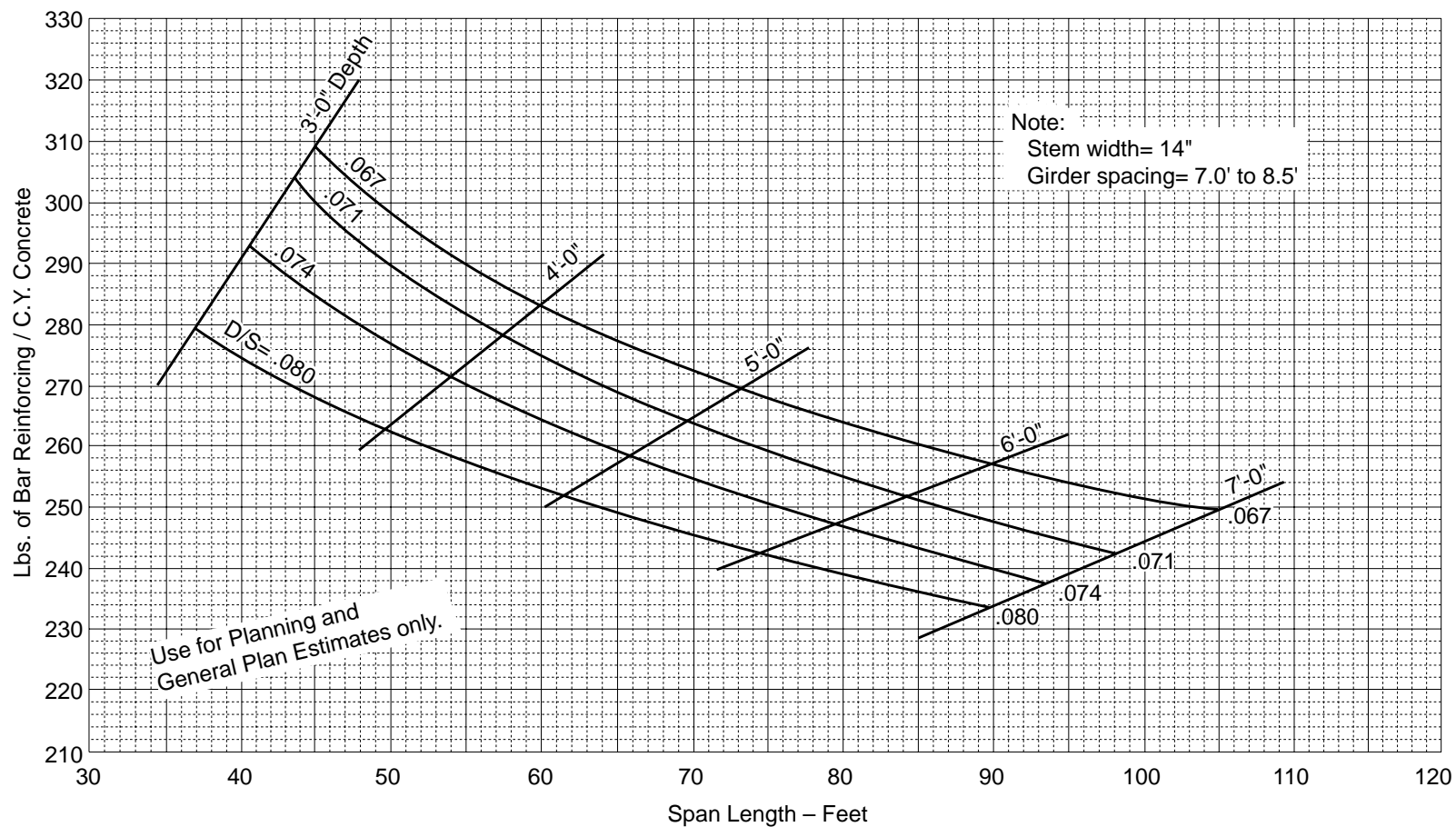


CIP/PS Box Girder Superstructure Concrete



Preliminary Quantity Survey

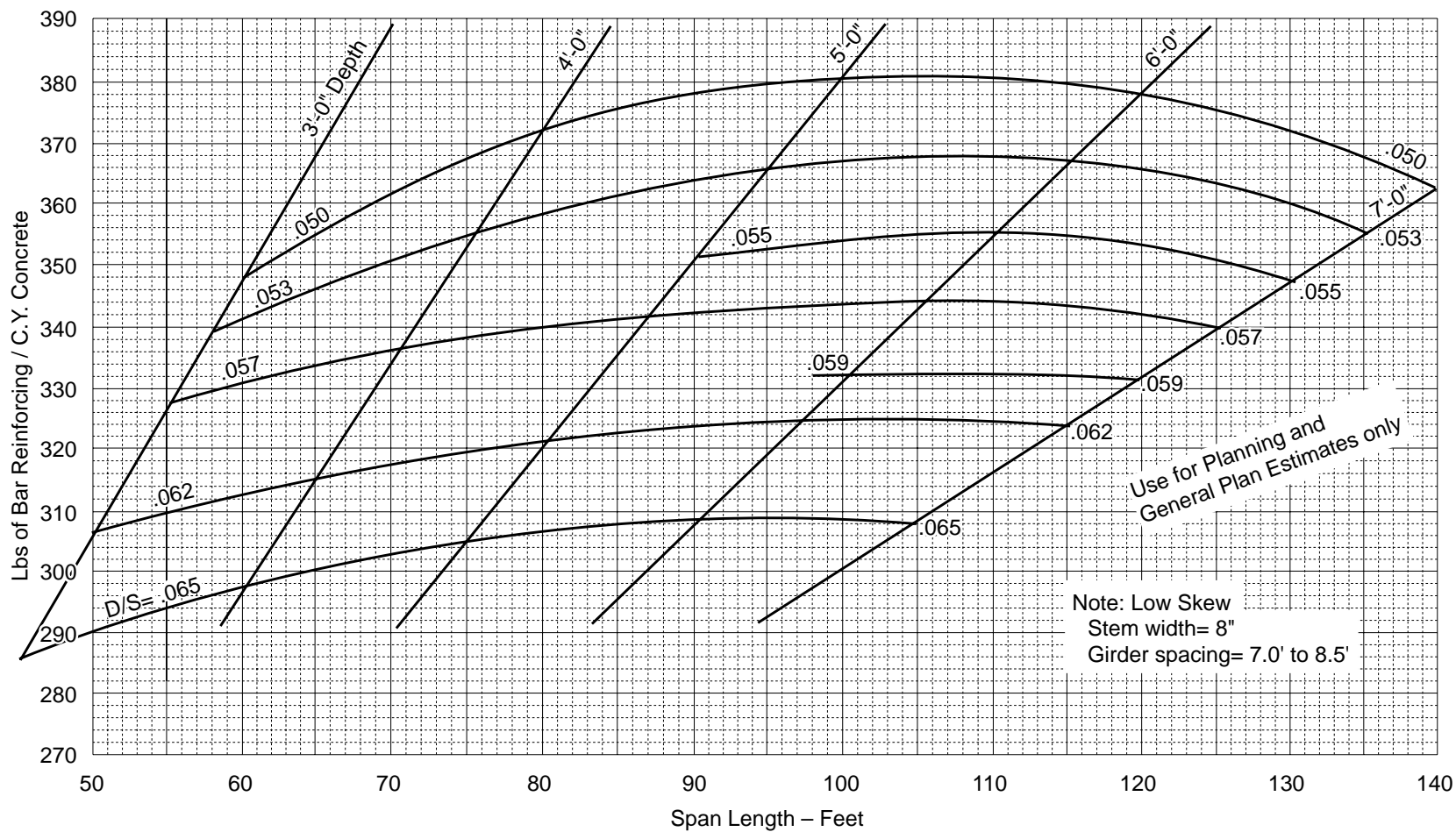
Girders, Deck and Diaphragms Only
(Calculate cap quantity separately)



Tee Beam Superstructure Bar Reinforcing



Preliminary Quantity Survey



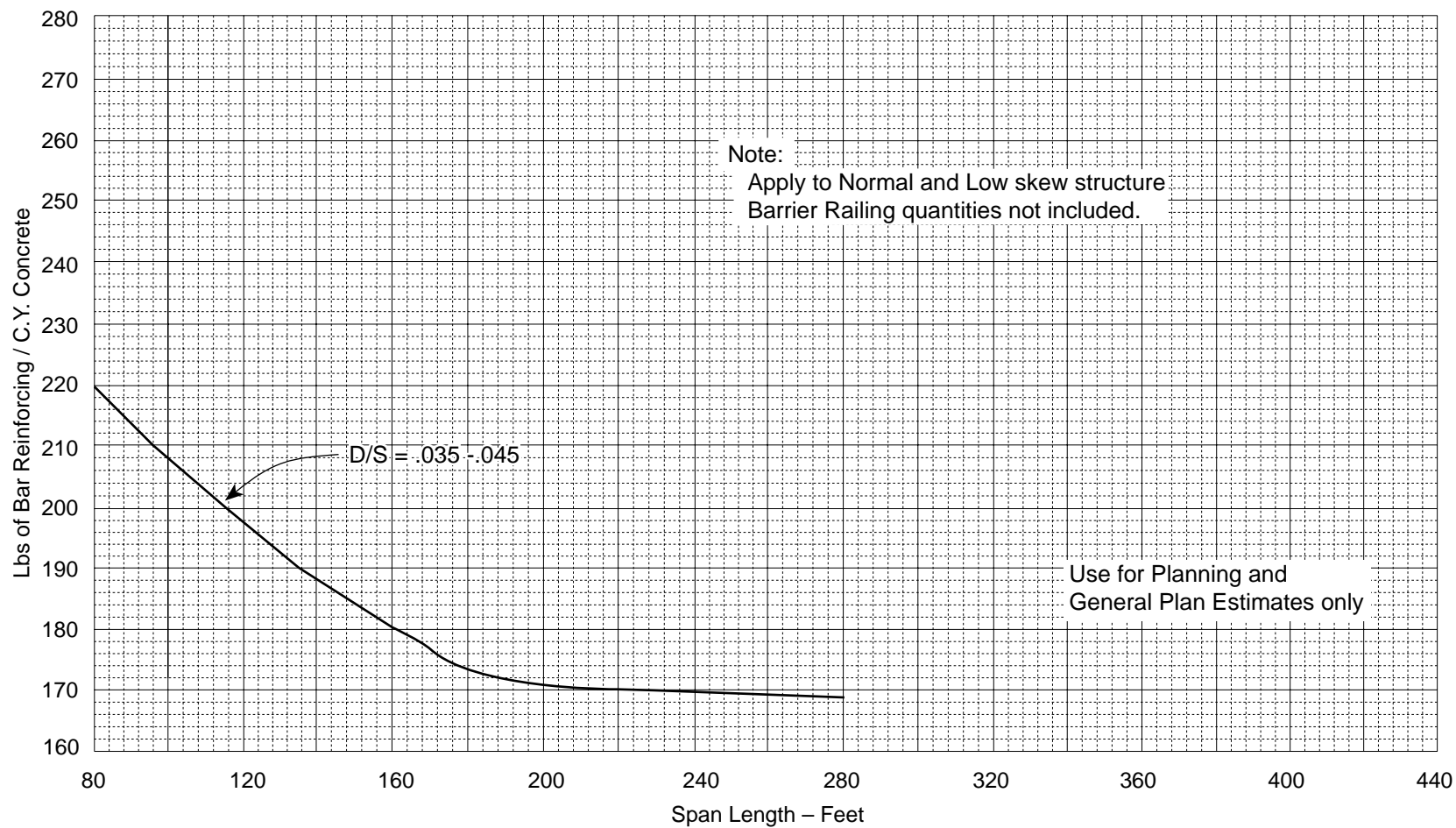
Conventionally Reinforced Box Girder Superstructure Bar Reinforcing

Note: Low Skew
Stem width= 8"
Girder spacing= 7.0' to 8.5'

Use for Planning and
General Plan Estimates only

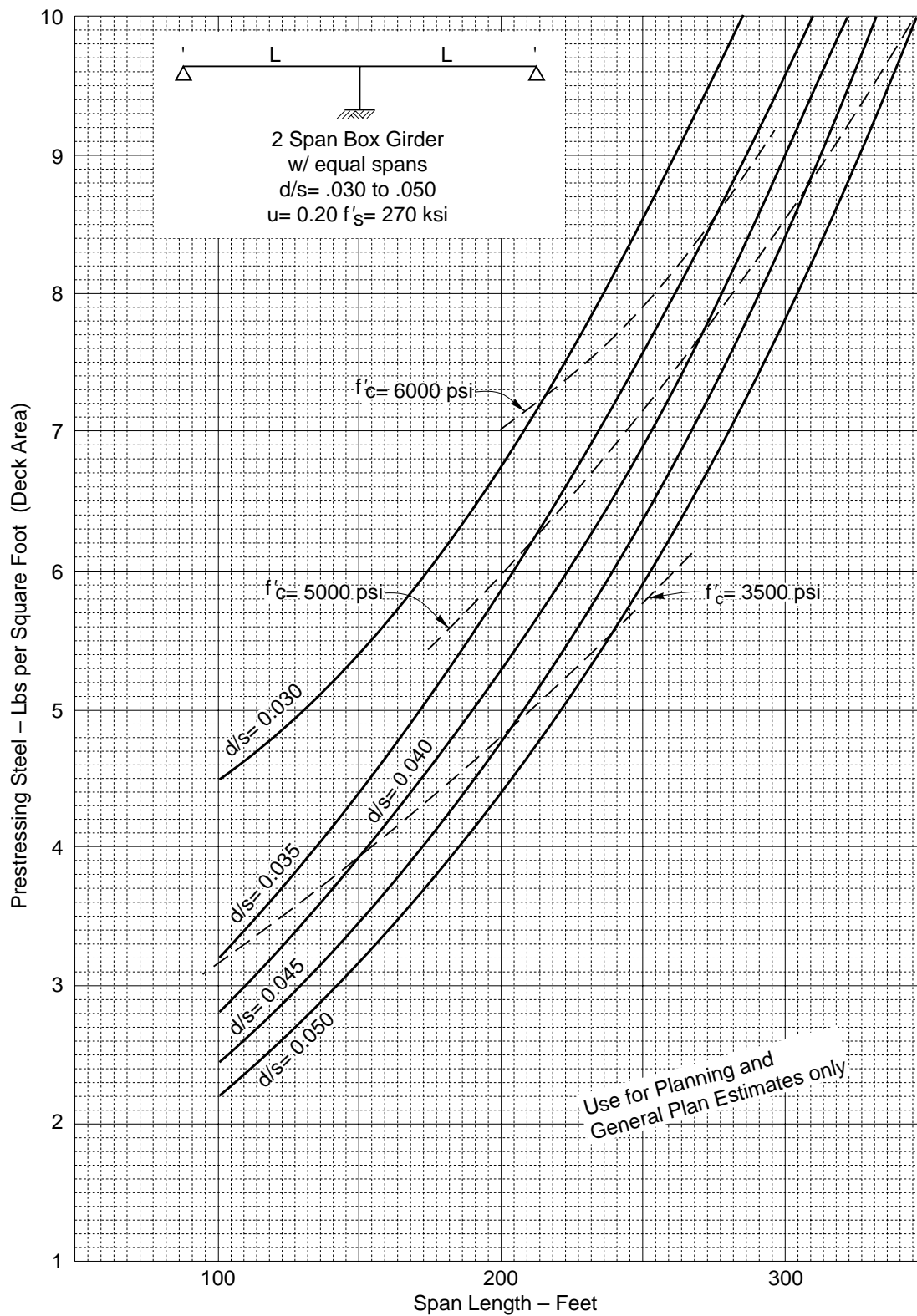


Preliminary Quantity Survey

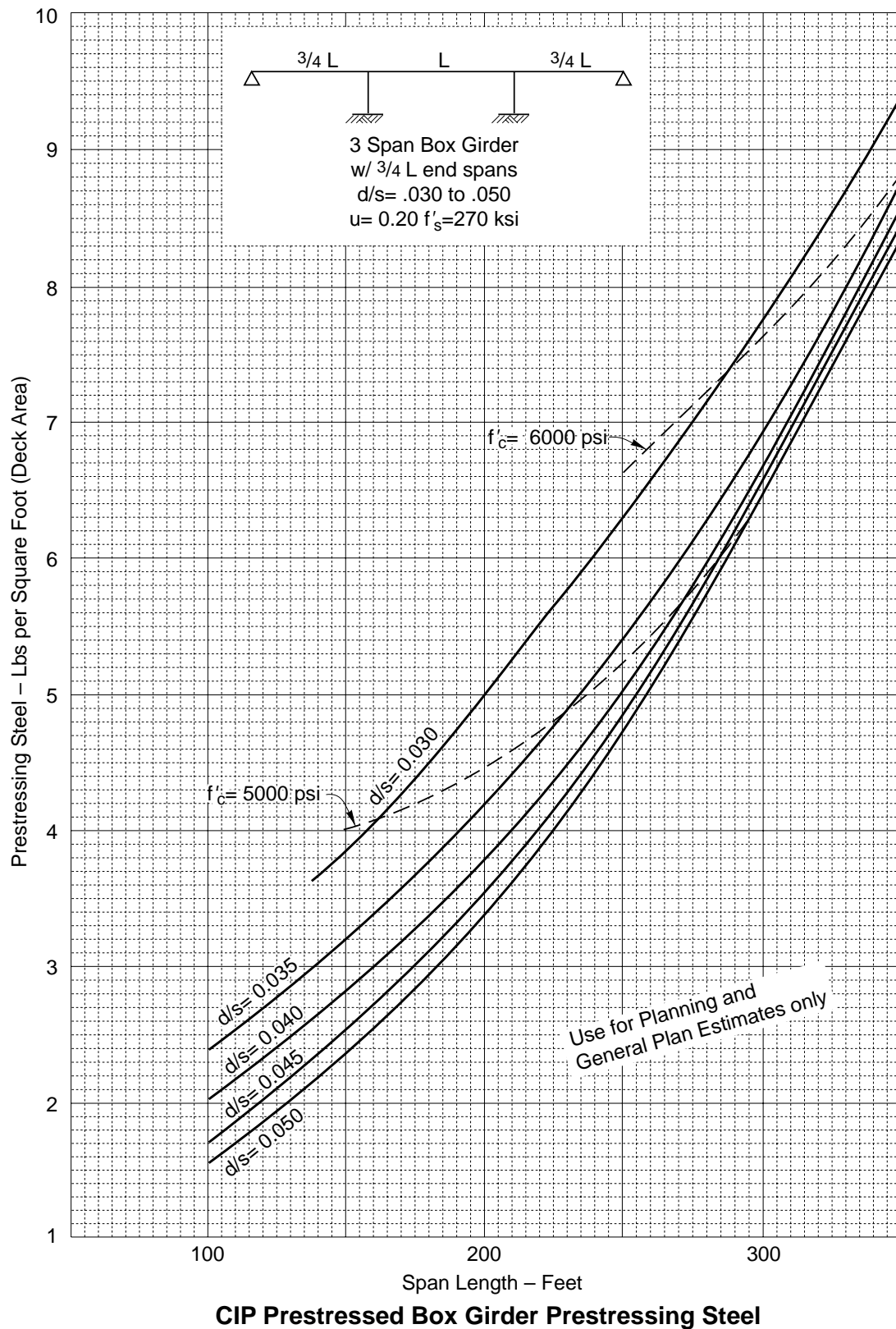


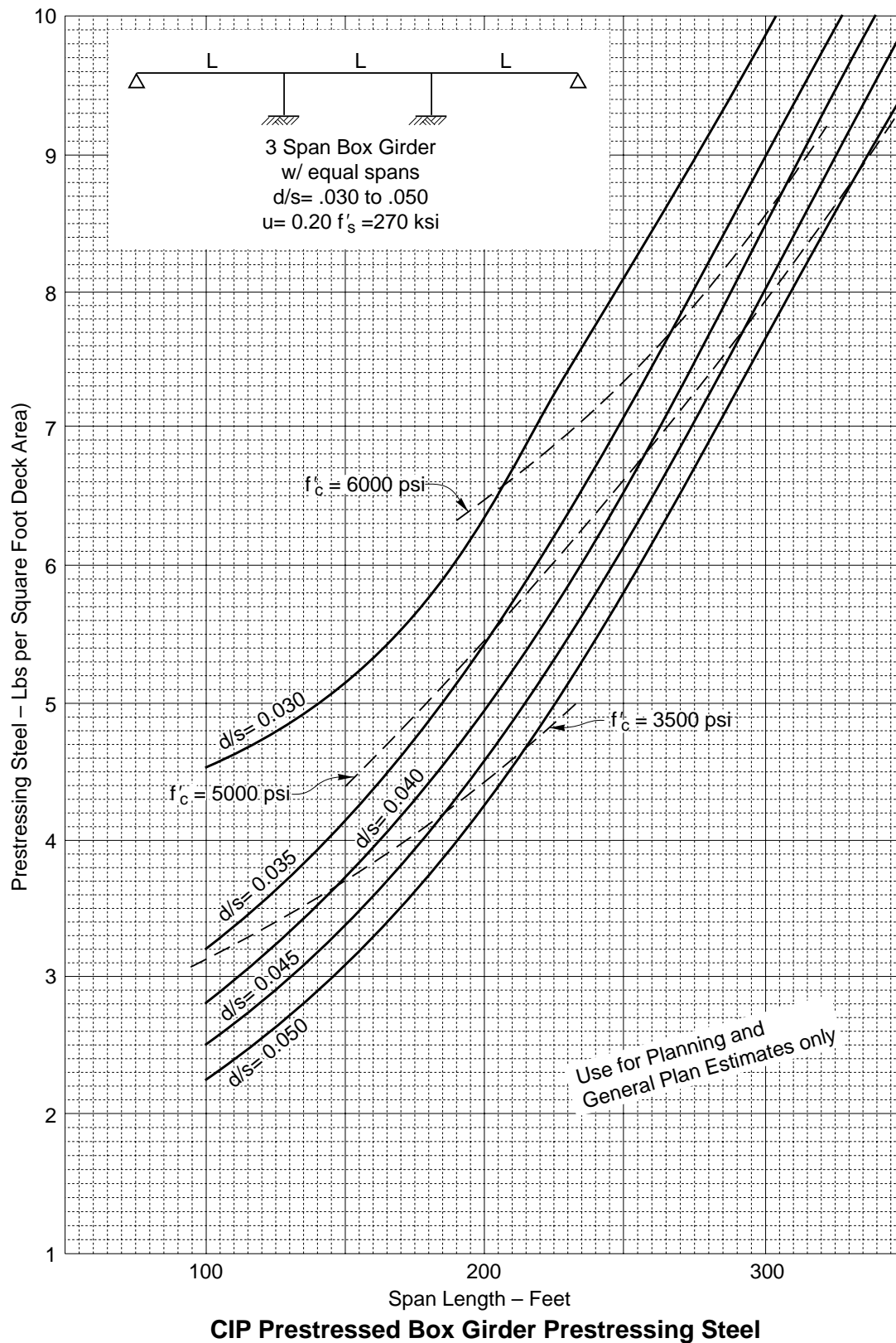
CIP/PS Box Girder Superstructure Bar Reinforcing

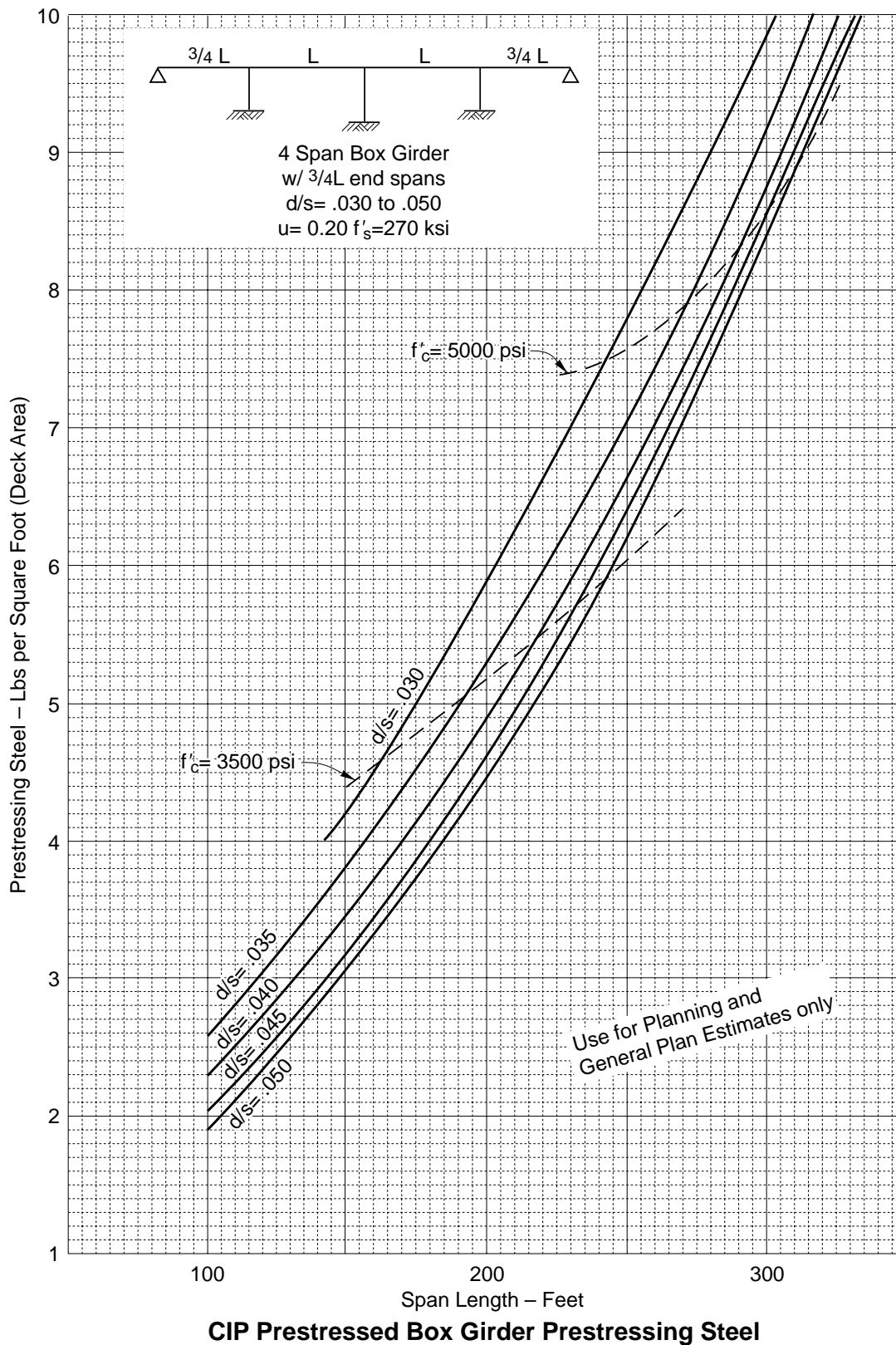


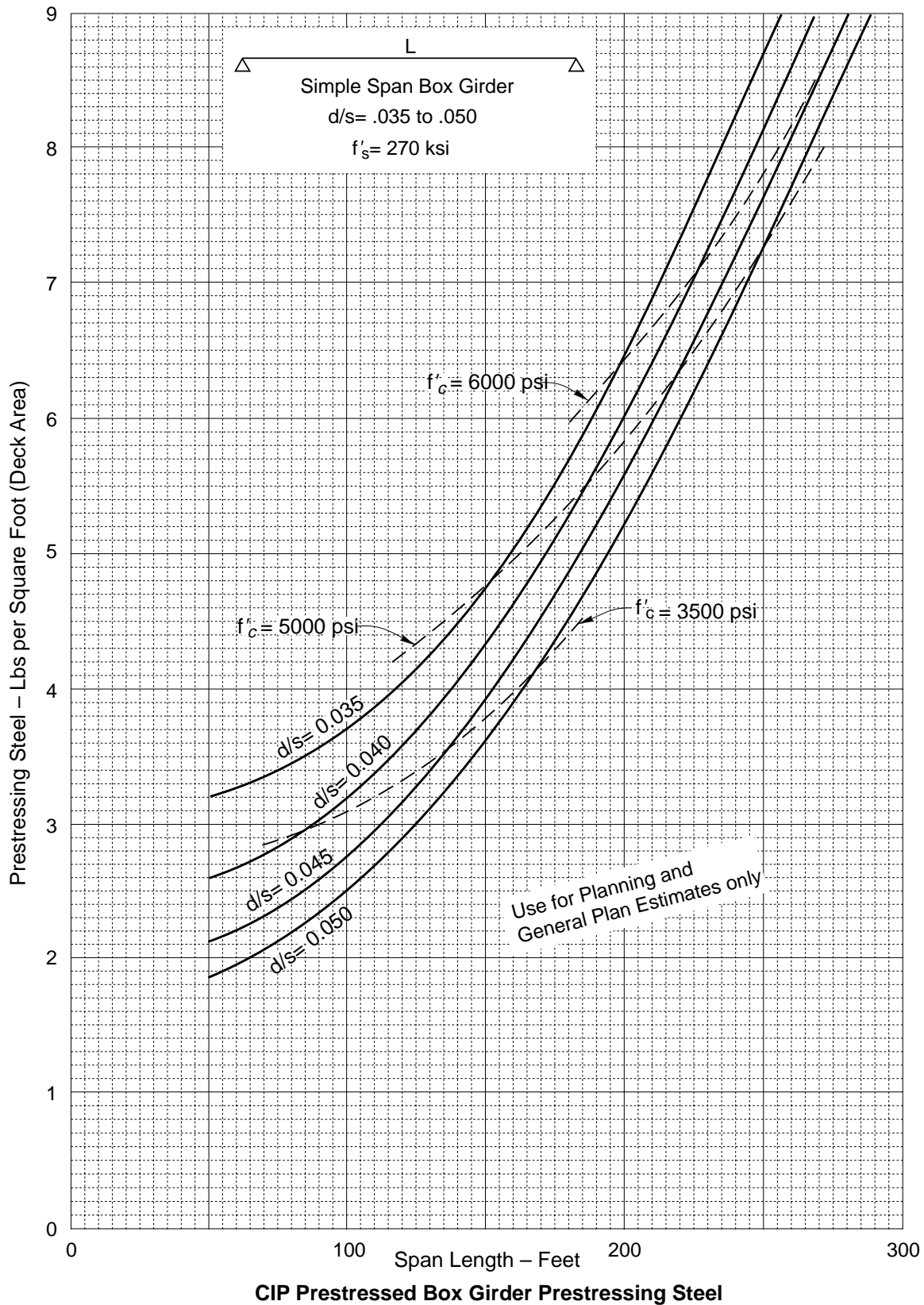


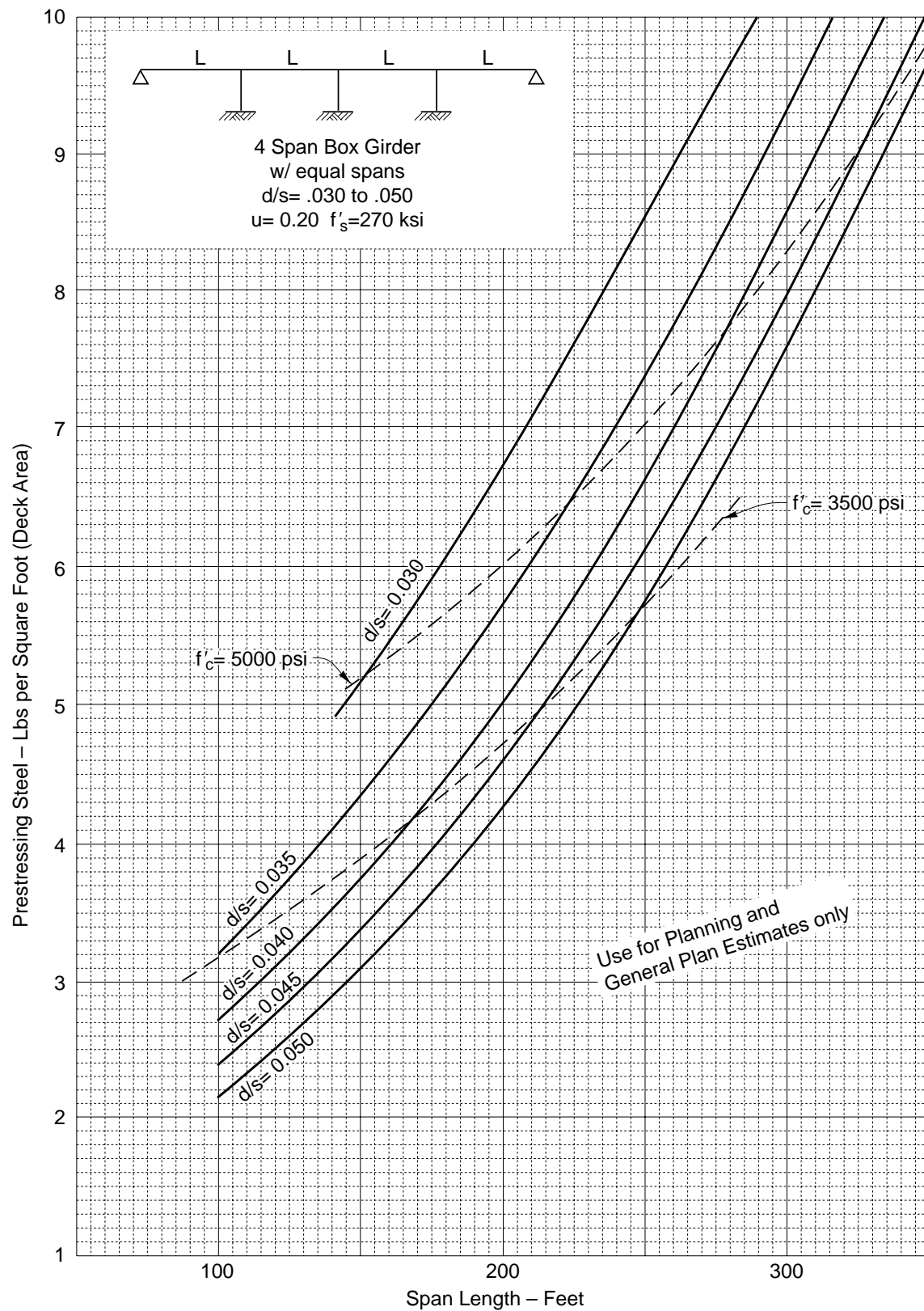
CIP Prestressed Box Girder Prestressing Steel







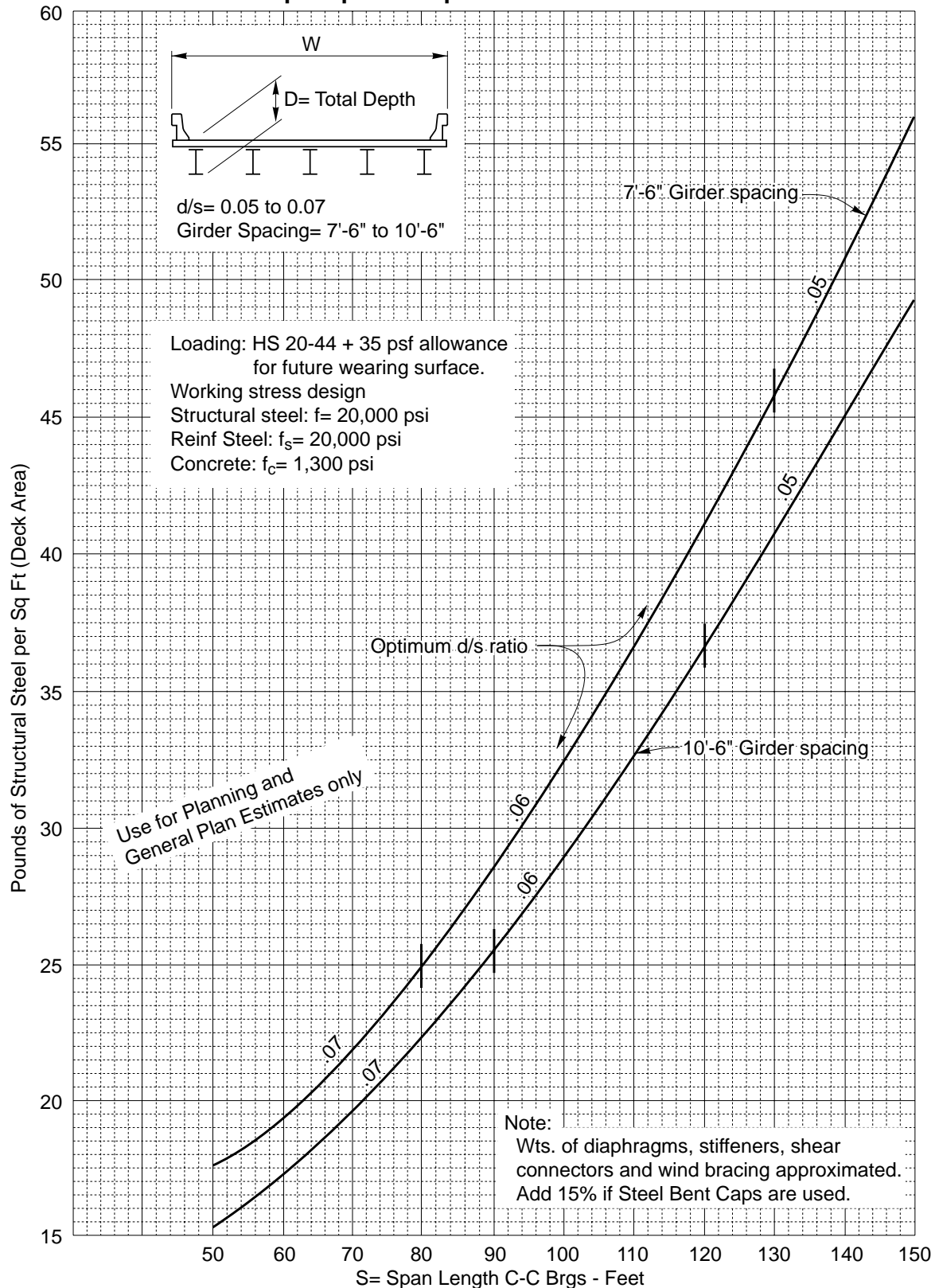


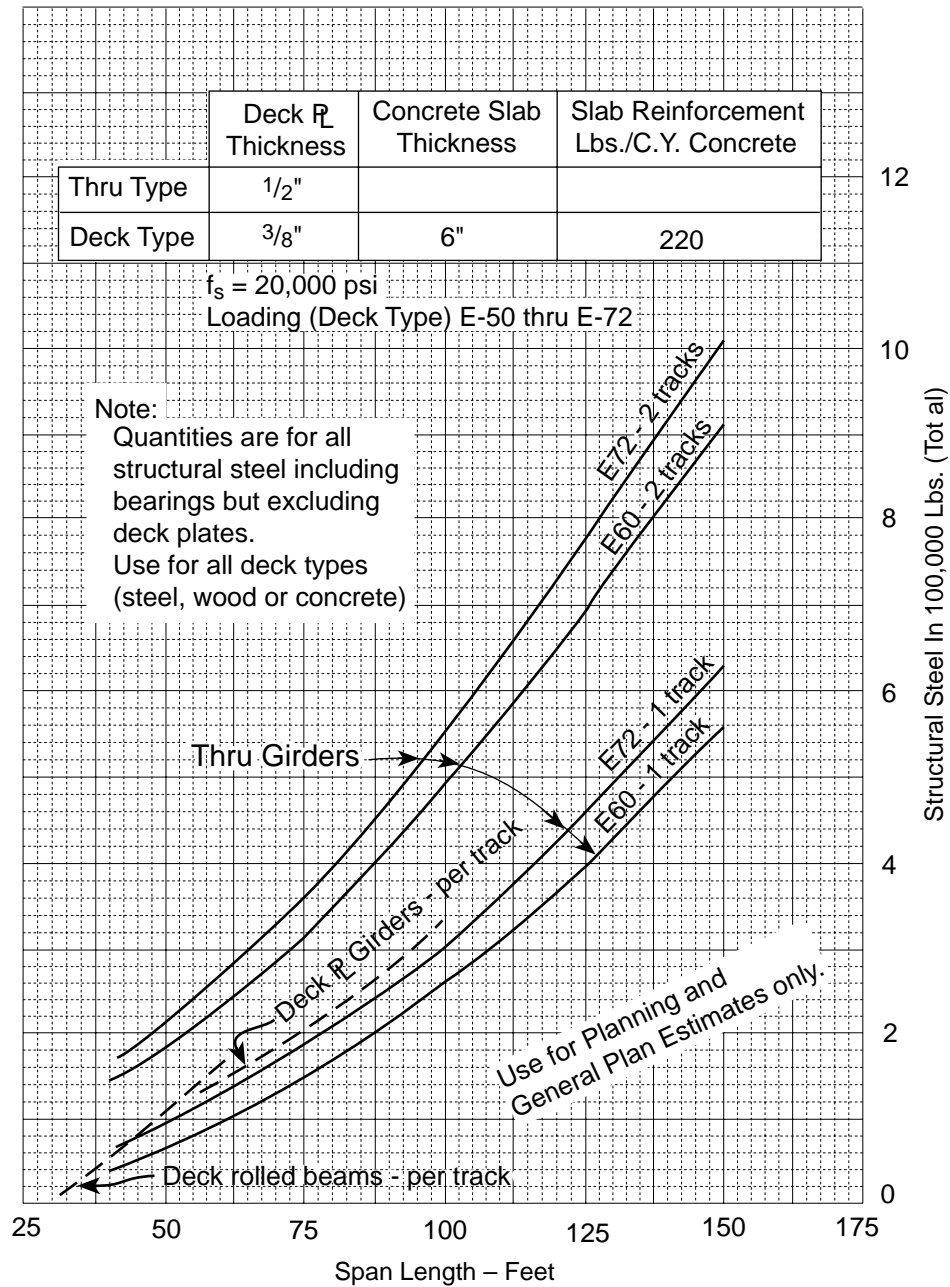


CIP Prestressed Box Girder Prestressing Steel



Simple Span Composite Welded Steel Girder





**Railroad Bridge Superstructure
(Structural Steel)**



Marginal Estimates

This estimate differs from the preceding estimates in that it is based on quantity calculations prepared from checked design plans. Marginal Estimates for bridge construction are segregated into:

Substructure

Excavation, Backfill, Concrete, Bar Reinforcing, Seal Course, Piling, etc.

Superstructure

Concrete, Bar Reinforcing, Structural Steel, Prestressing Steel, Joint Seals, Deck Seals, Miscellaneous Metal (Restrainer), Barriers, etc.

Other Items

Approach Slabs, Water Supply Lines, Sprinkler Control Conduits, Sound Walls, Temporary Railing, Removal items, items suffixed "Retaining Wall," Slope Paving items, etc.

A Marginal Estimate Form should be filled out for each structure, retaining wall (with separate bridge number) or sound wall. Whenever there are identical parallel structures or where more than one structure is shown on a General Plan, only one Marginal Estimate Form should be filled out. Structure type coding to be entered in the "Type" block on the Marginal Estimate forms is given on page 11-27.

The method of payment for each contract item is established by the Specifications Production Section. Unit or lump sum prices, appropriate to the characteristics of the contract are determined for each contract item by the Cost Estimates Section.

Quantity Take-Off Procedures

First, determine the limits of each concrete type and the division between superstructure and substructure as shown on Page 11-29.

Divide the work into logical units such as footings, columns, etc. Be liberal with descriptions which will identify each unit. Use sketches where necessary for clarity.

If there is doubt whether or not to list an item, list it with a brief explanation and the Specifications Engineer will decide how it should be handled.

Two persons, or groups, will be assigned to calculate quantities for the same structure. They should collaborate to the extent of setting up the same division of units for each item. When calculations are complete, the two shall compare results and make necessary corrections.

In checking quantities, the two estimators should agree within the following limits:

Barrier, piles, precast units, or any item paid as EACH Exact

Concrete, bar reinforcing steel, and structural steel quantities 3%

All others 5%

The close review of the plans required in the process of quantity take-off frequently results in the discovery of errors or omissions. These must be brought to the designer's attention.

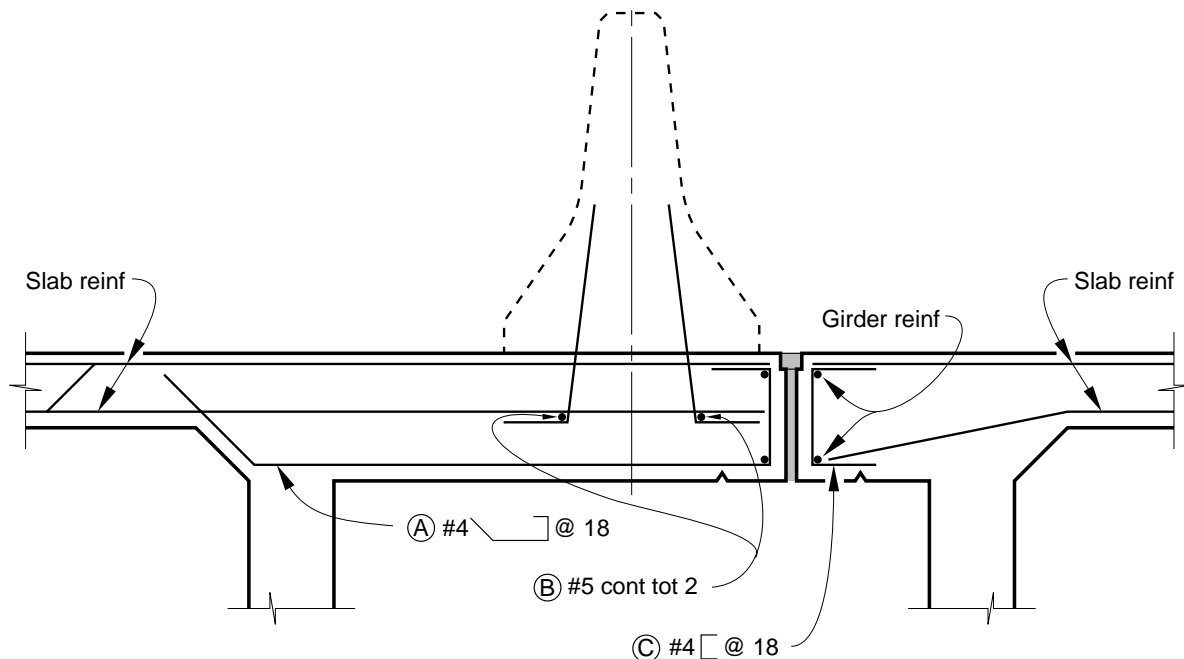


Quantity Take-Off Worksheet Forms

There are only two commonly used worksheets. One is Form DS-D0018, an 8 1/2 x 11 blank grid sheet. The other is Form DS-D0110, "Reinforcing Steel Quantities," for tabulating reinforcing steel.

Coding Bar Reinforcing Steel

For the more complicated structures or portions of structures, it is suggested that the estimator and checker code (by number or letter) the reinforcing bars on the estimating prints prior to quantity take-off. This will facilitate final checking of quantities and reduce the possibility of omissions. An example is as follows:



STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION												
REINFORCING STEEL QUANTITIES												
DS-D-0110 (REV. 5/93)												
PROJECT			BRIDGE			NAME			SHEET _____ OF _____			
DATE												
ITEM	NUMBER OR WEIGHT/FT OF WALL	LENGTH TO 1/10 FOOT	TOTAL LENGTH - EACH SIZE									
			NO. 4	NO. 5	NO. 6	NO. 7	NO. 8	NO. 9	NO. 10	NO. 11	NO. 14	NO. 18
(A)	100	5.8	580									
(B)	2	150	300									
(C)	100	2.6	260									



Lump Sum Items and Fully Comp'ed Items

Backup quantities are to be submitted for items paid for as “Lump Sum.” Quantities for the item “Bridge Removal” should be calculated either in cubic yards or square foot of bridge deck area. Other Lump Sum items should include a breakdown of quantity of all work involved in the item.

Marginal estimates should include quantity breakdowns, along with back-up quantity calculations, for all items of work that might be fully comp'ed. Fully comp'ed items are items of work paid as part of another item.

Example:

Minor Concrete (Minor Structure) may include structure backfill, structure excavation, drill and bond dowel, concrete, etc. Quantities should be submitted for each individual item of work to evaluate the unit cost.

Structure Type Coding

The following coding is to be entered in the “Type” block on the Marginal Estimate summary forms. (See Appendix A-12, A-13, A-14, A-15)

The **first** character in the field identifies the major material used or the construction method:

- C – Concrete
- S – Steel
- T – Timber
- M – Masonry
- P – P/S, P/C
- I – P/S, CIP

The **second** and **third** characters describe the physical configuration of the main span:

- | | |
|-----------------|-----------------------|
| BG – Box Girder | IG – “I” girder |
| SL – Slab | IU – Inverted U |
| SS – Seal Slab | UG – “U” girder |
| DU – Deck Units | WG – Welded girder |
| TG – “T” girder | RB – Rolled beam |
| DT – Double T | TD – Truss deck |
| IT – Inverted T | TC – Truss Cantilever |



The **second** and **third** characters – *continued*

TB – Truss Bascule	BW – Bin wall
TL – Truss lift	PA – Pipe, arch
SU – Suspension	P1 – Single pipe
AR – Arch	P2 – Double pipe
LS – Log stringer	B1 – Single box
T1 – Type 1 wall	B2 – Double box
T2 – Type 2 wall	B3 – Triple box
T3 – Type 3 wall	B4 – Quadruple box
T4 – Type 4 wall	B5 – Quintuple box
T5 – Type 5 wall	XX – None of the above

The **fourth** character indicates the function of the structure:

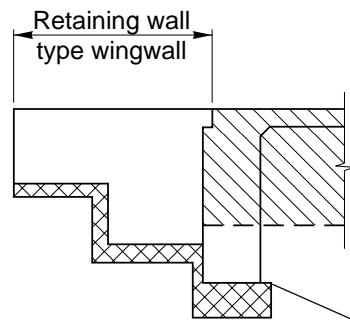
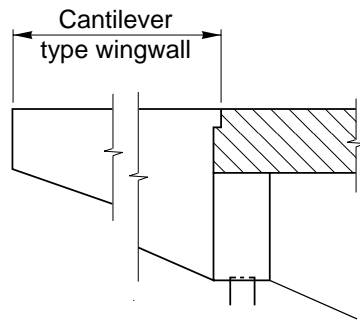
A – Undercrossing	M – Equestrian undercrossing
B – Overcrossing	N – Cattle pass undercrossing
C – Separation	O – Culvert undercrossing
D – Underpass	P – Pedestrian bridge
E – Overhead	Q – Pedestrian overcrossing
F – Bridge	R – Equestrian overcrossing
G – Bridge and Overhead	S – Pipeline overcrossing
H – Viaduct	T – Pump house
I – Sidehill Viaduct	U – Culvert
J – Double deck viaduct	W – Retaining wall
K – Tunnel	X – Sound wall
L – Pedestrian undercrossing	Z – None of the above

The **fifth** character identifies the nature of construction:

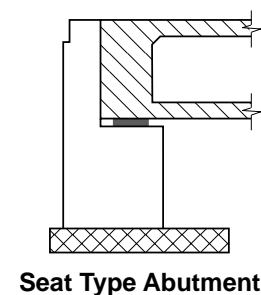
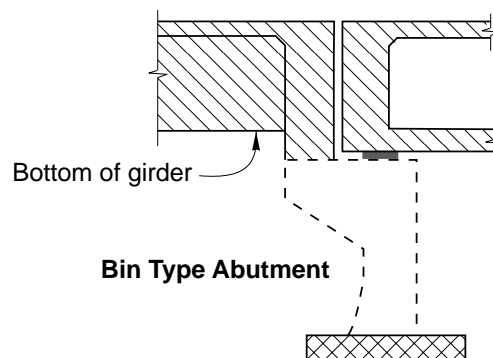
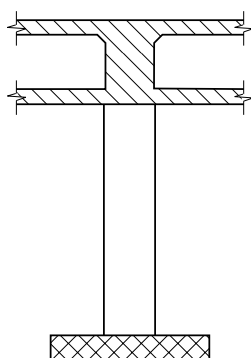
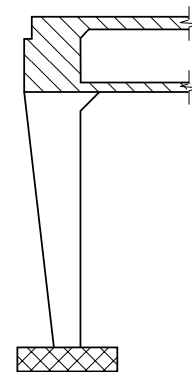
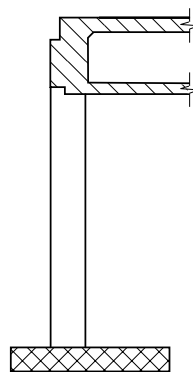
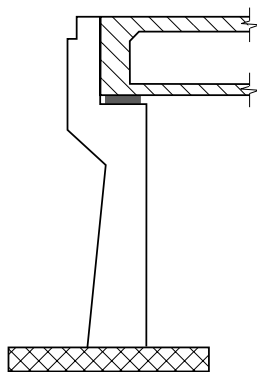
N – New	Q – Earthquake Retrofit
W – Widening	R – Raising Bridge
E – Extension	U – Rail Replacement (Upgrade Rail)
M – Modification	F – Repair/Rehab



Concrete Type Limits and Division Between Superstructure and Substructure





Wingwalls and Diaphragm Type Abutments



Note:

Retaining walls that are not classified as wingwalls are paid as Structural Concrete, Retaining Wall. Bent Caps, Top Slabs, and Diaphragms for Precast Girder Bridges are paid as Structural Concrete, Bridge.

Superstructure		} Structural Concrete, Bridge
Substructure		
		} Structural Concrete, Bridge Footing

***Quantity Take-off Calculations, Estimate Forms, and Quantity Summary Sheets***

Quantity calculations are to be clearly legible and easy to follow, including sketches and location references. They should be titled properly, identifying the estimator and the checker, the structure name and bridge number, and the date the calculations were performed.

Calculated quantities are to be summarized on State printed forms. The following summarizes the forms available. A copy of each form is included in the Appendix.

Form Number	Form Name
DS-D0001	Historical Cost Record
DS -D0015	Pile Summary
DS-D0016	Bridge General Plan Estimate or Planning Estimate
DS-D0017	Miscellaneous General Plan Estimate or Planning Estimate
DS-D0019	Structural Quantity and Marginal Estimate
DS-D0019A	Marginal Estimate - Miscellaneous Structure Other Than Bridge
DS-D0019B	Marginal Estimate - Miscellaneous Structure Other Than Bridge (EQ Retrofit)
DS-D0019SUP	Marginal Estimate - Miscellaneous Structure Other Than Bridge
DS-D0022	Summary - Structure Excavation and Structure Backfill
DS-D0050	Concrete Summary
DS-D0067	Bar Reinforcing Summary
DS-D0100	Pile Quantity Calculations
DS-D0110	Reinforcing Steel Quantities
DS-D0153	Sound Wall Summary
DS-D0154	Summary – Miscellaneous Metal – Bridge and Restrainer

Note: Do not copy forms from Appendix. Obtain a current copy from Floor Clerks.

**Quantity Summaries for Resident Engineer's Pending File**

The following forms are available from Floor Clerks for summarizing certain items for the Resident Engineer's use in making progress pay estimates. Therefore, the breakdown should be in units as they would be constructed. They are to be submitted with the Marginal Estimate. The Cost Estimates Section will forward them to the R.E. Pending File. An example copy of each form is included in the Appendix of this chapter.

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

SUMMARY – STRUCTURE EXCAVATION AND STRUCTURE BACKFILL

DS - D0022 (REV. 4/93)

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

PILE SUMMARY

DS - D0015 (REV. 4/93)

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

CONCRETE SUMMARY

DS - D0050 (REV. 4/93)

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

BAR REINFORCING SUMMARY

DS - D0067 (REV. 4/93)

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION

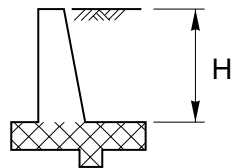
SUMMARY- MISCELLANEOUS METAL – BRIDGE AND RESTRAINER

DS - D0154 (REV. 5/93)

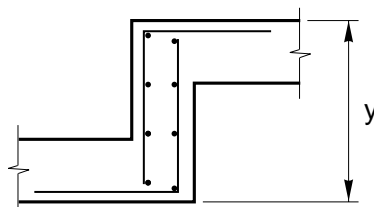


Concrete Quantities for Retaining Wall Type 1

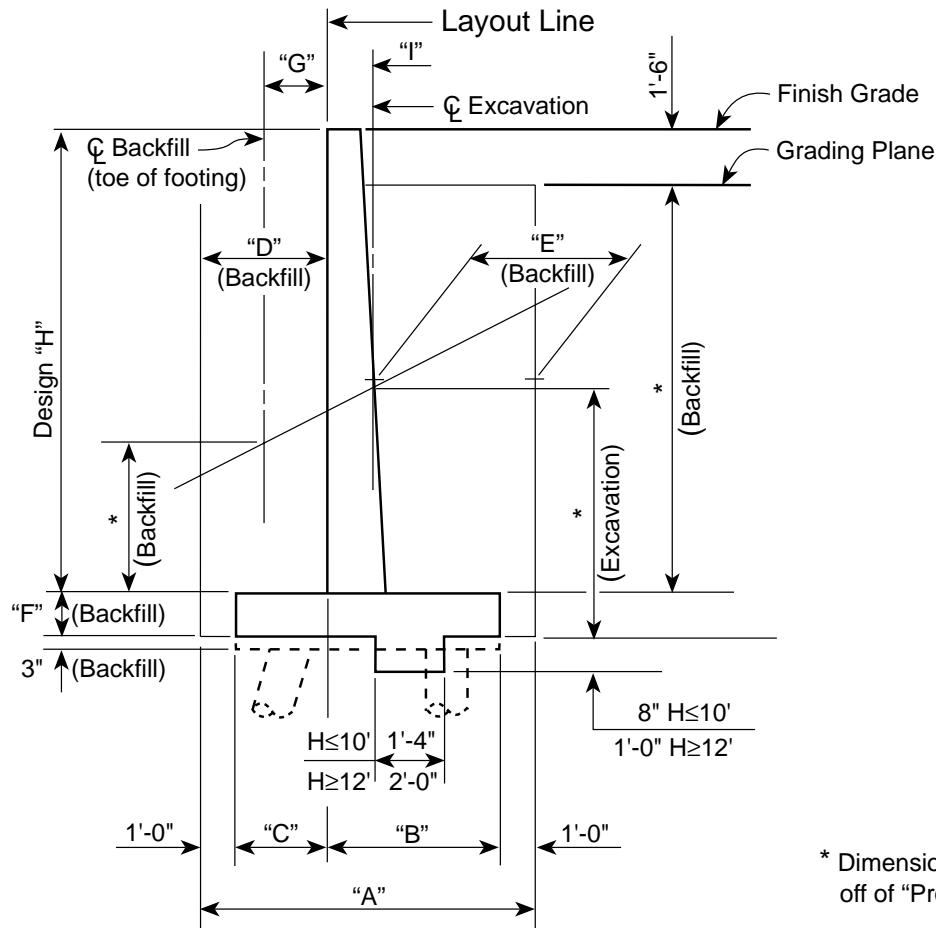
H Ft	Stem CF/LF	Footings CF/LF			H Ft
		Spread	w/45 Ton Piles w/o Deduc. for Piles		
			Concrete or Steel Piles	Timber Piles	
4	4.33	4.58	5.90	6.94	4
6	6.75	5.75	5.90	6.94	6
8	9.33	6.92	7.32	8.61	8
10	12.08	8.08	8.74	10.28	10
12	15.00	10.36	10.15	11.94	12
14	18.08	12.00	12.00	14.00	14
16	21.33	13.25	13.50	15.75	16
18	24.75	15.33	15.83	18.33	18
20	28.33	16.67	17.41	20.17	20
22	32.08	20.00	21.00	24.00	22
24	39.25	24.08	25.40	28.71	24
26	47.67	29.31	30.88	34.44	26
28	53.08	35.04	36.85	40.67	28
30	63.75	41.08	43.27	47.46	30
32	75.67	53.71	58.55	63.11	32
34	83.25	64.56	69.79	74.60	34
36	91.17	74.56	80.15	85.22	36



Retaining Wall Footing – Step Reinforcement



y (ft)	#/ft
2	8.7
3	11.4
4	14.0
5	16.7
6	19.4
7	22.0
8	24.7
9	27.4
10	30.1
11	32.8
12	35.4



Retaining Wall Type 1 Section

Table For Excavation & Backfill Dimensions										
Design 'H'	4'	6'	8'	10'	12'	14'	16'	18'	20'	22'
"A"	5.17'	6.17'	7.17'	8.17'	9.17'	10.00'	11.00'	12.00'	13.00'	14.00'
"B"	2.17'	2.83'	3.50'	4.17'	4.83'	5.33'	6.00'	6.67'	7.33'	8.00'
"C"	1.00'	1.33'	1.67'	2.00'	2.33'	2.67'	3.00'	3.33'	3.67'	4.00'
"D"	2.00'	2.33'	2.67'	3.00'	3.33'	3.67'	4.00'	4.33'	4.67'	5.00'
"E"	2.06'	2.67'	3.30'	3.93'	4.55'	5.01'	5.64'	6.26'	6.88'	7.51'
"F"	1.17'	1.17'	1.17'	1.17'	1.17'	1.25'	1.25'	1.33'	1.33'	1.50'
"G"	1.00'	1.17'	1.34'	1.50'	1.67'	1.84'	2.00'	2.17'	2.34'	2.50'
"I"	0.59'	0.76'	0.92'	1.09'	1.26'	1.33'	1.50'	1.67'	1.83'	2.00'

Note: 1. For Design "H" of 4 feet with pile footing, use dimensions shown for 6 feet.

**Standard Architectural Columns**

One Way Flare

Column Type 2						
Shaft	Top Height	Dimensions		Volume Cubic Feet		
		a	b	Hexagon	Octagon	Round
4'-0"	12'-0"	2'-0"	6'-0"	230	223	215
5'-6"	16'-6"	2'-9"	8'-3"	599	580	558
7'-0"	21'-0"	3'-6"	10'-6"	1234	1195	1151

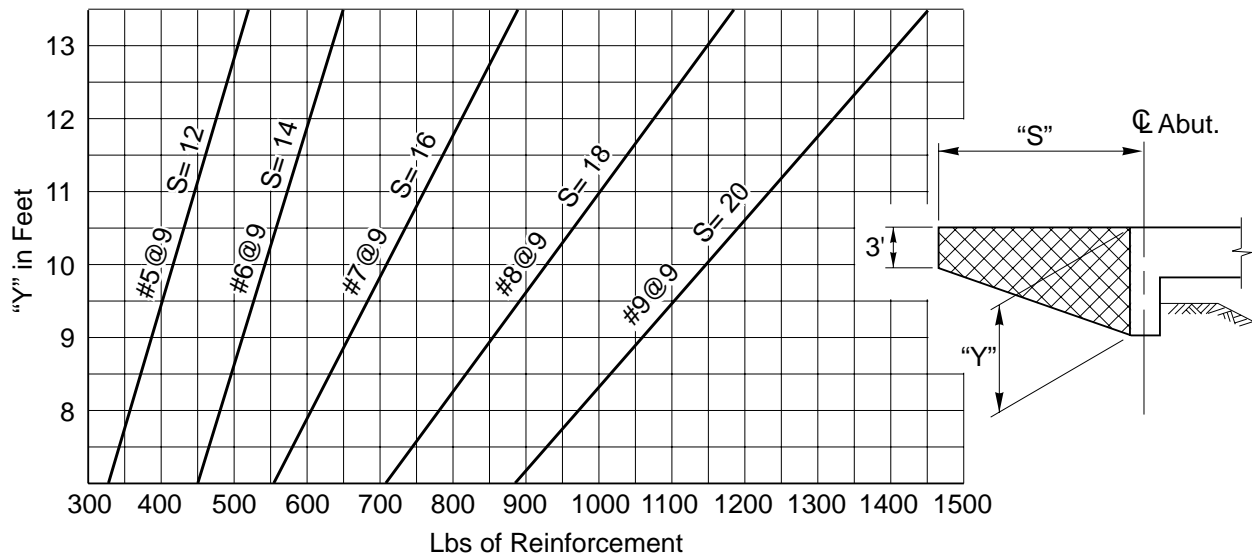
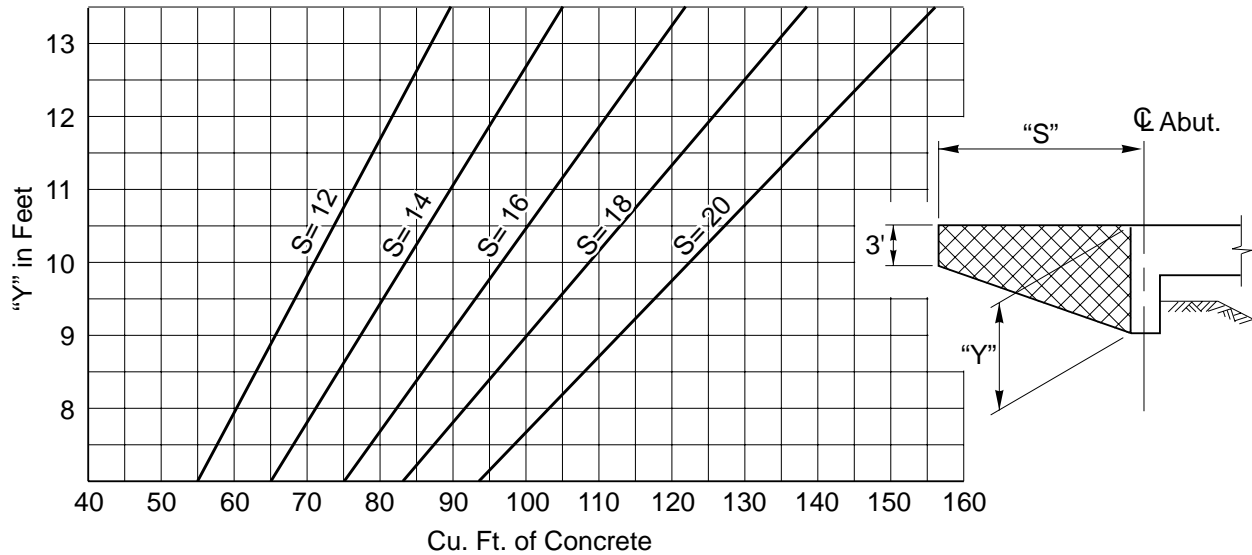
Two Way Flare

Column Type 3							
Shaft	Top Height	Dimensions			Volume Cubic Feet		
		a	b	c	Hexagon	Octagon	Round
4'-0"	12'-0"	2'-0"	6'-0"	1'-0"	248	273	241
5'-6"	16'-6"	2'-9"	8'-3"	1'-4 1/2"	644	710	627
7'-0"	21'-0"	3'-6"	10'-6"	1'-9"	1327	1463	1293

Refer to *Bridge Design Details* 7-31.1 and 7-31.2

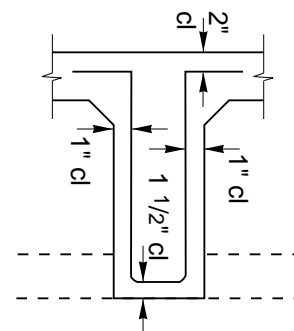


Wingwall for Diaphragm Abutment (Vertical)



Note: See Standard Plan B0-1

Girder Stirrup Lengths and Weights (#5 Bar)
CIP T – Beam or CIP (Non Prestressed) Box Girder

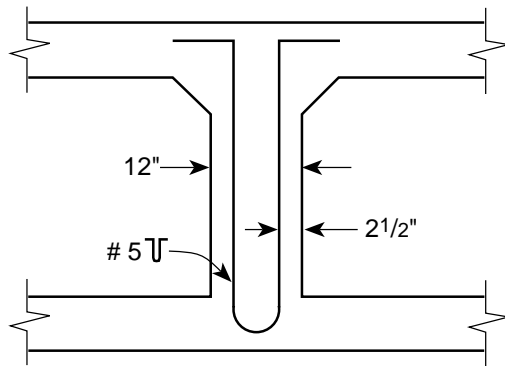


Depth		2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"
Width 8"	Length	5.76	6.76	7.76	8.76	9.76	10.76	11.76	12.76	13.76	14.76	15.76	16.76
	Weight	6.01	7.05	8.10	9.14	10.18	11.22	12.26	13.31	14.35	15.39	16.44	17.48
10"	Length	5.93	6.93	7.93	8.93	9.93	10.93	11.93	12.93	13.93	14.93	15.93	16.93
	Weight	6.18	7.22	8.27	9.31	10.36	11.40	12.44	13.48	14.53	15.57	16.61	17.66
12"	Length	6.10	7.10	8.10	9.10	10.10	11.10	12.10	13.10	14.10	15.10	16.10	17.10
	Weight	6.36	7.40	8.44	9.49	10.53	11.57	12.62	13.66	14.71	15.75	16.79	17.84
14"	Length	6.26	7.26	8.26	9.26	10.26	11.26	12.26	13.26	14.26	15.26	16.26	17.26
	Weight	6.53	7.57	8.62	9.66	10.70	11.75	12.79	13.83	14.87	15.92	16.96	18.00
16"	Length	6.43	7.43	8.43	9.43	10.43	11.43	12.43	13.43	14.43	15.43	16.43	17.43
	Weight	6.70	7.75	8.79	9.83	10.88	11.92	12.96	14.01	15.05	16.09	17.14	18.18
18"	Length	6.60	7.60	8.60	9.60	10.60	11.60	12.60	13.60	14.60	15.60	16.60	17.60
	Weight	6.88	7.92	8.96	10.01	11.05	12.09	13.14	14.18	15.23	16.27	17.31	18.36
20"	Length	6.76	7.76	8.76	9.76	10.76	11.76	12.76	13.76	14.76	15.76	16.76	17.76
	Weight	7.05	8.10	9.14	10.18	11.22	12.27	13.31	14.35	15.39	16.44	17.48	18.52
22"	Length	6.93	7.93	8.93	9.93	10.93	11.93	12.93	13.93	14.93	15.93	16.93	17.93
	Weight	7.23	8.27	9.31	10.36	11.40	12.44	13.48	14.53	15.57	15.58	15.59	15.60
24"	Length	7.10	8.10	9.10	10.10	11.10	12.10	13.10	14.10	15.10	16.10	17.10	18.10
	Weight	7.40	8.44	9.49	10.53	11.57	12.62	13.66	14.70	15.75	16.79	17.84	18.88

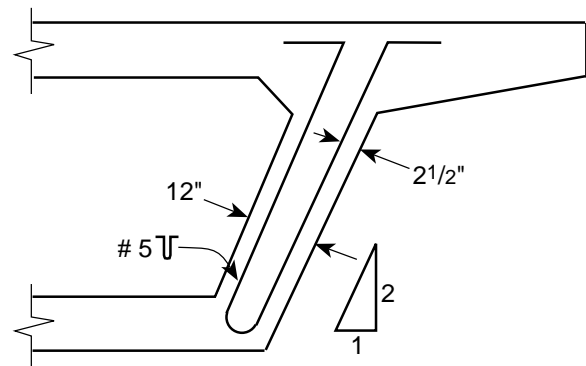




**Girder Stirrup Lengths and Weights (#5 Bar)
(CIP/PS Box Girder)**



**Interior Girder
or
Vertical Exterior Girder**



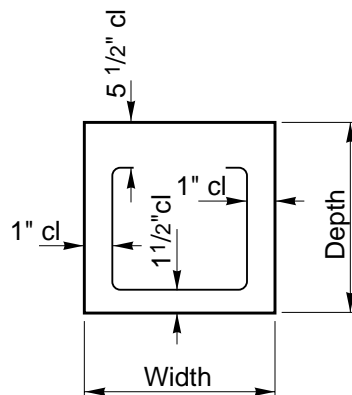
Sloping Exterior Girder

	Interior Girder		Sloping Exterior Girder	
Depth	Length	Weight	Length	Weight
3'-0"	6.58'	6.86	7.14'	7.45
4'-0"	8.58'	8.95	9.38'	9.78
5'-0"	10.58'	11.03	11.62'	12.12
6'-0"	12.58'	13.12	13.86'	14.46
7'-0"	14.58'	15.21	16.10'	16.79
8'-0"	16.58'	17.29	18.34'	19.13
9'-0"	18.58'	19.38	20.58'	21.46
10'-0"	20.58'	21.46	22.82'	23.80



Cap-Single Stirrup Lengths & Weights (#5 Bar)

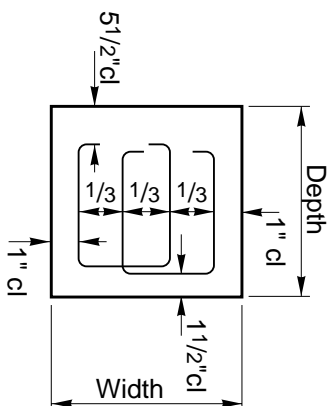
Depth		2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"
Width	Length	6.43	7.43	8.43	9.43	10.43	11.43	12.43	13.43
	Weight	6.70	7.75	8.79	9.83	10.88	11.92	12.96	14.01
2'-6"	Length	6.93	7.93	8.93	9.93	10.93	11.93	12.93	13.93
	Weight	7.23	8.27	9.31	10.35	11.40	12.44	13.48	14.53
3'-0"	Length	7.43	8.43	9.43	10.43	11.43	12.43	13.43	14.43
	Weight	7.75	8.79	9.83	10.88	11.92	12.96	14.01	15.05
3'-6"	Length	7.93	8.93	9.93	10.93	11.93	12.93	13.93	14.93
	Weight	8.27	9.31	10.36	11.40	12.44	13.48	14.53	15.47
4'-0"	Length	8.43	9.43	10.43	11.43	12.43	13.43	14.43	15.43
	Weight	8.79	9.83	10.88	11.92	12.96	14.01	15.05	16.09





Cap-Double Stirrup Lengths & Weights (#5 Bar)

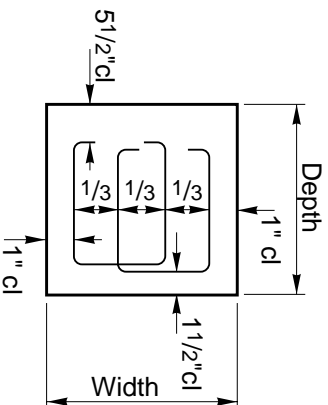
Depth		2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"
Width	Length	13.07	15.07	17.07	19.07	21.07	23.07	25.07	27.07	29.07	31.07	33.07
	Weight	13.63	15.72	17.81	19.89	21.98	24.16	26.15	28.24	30.32	32.41	34.49
3'-6"	Length	13.74	15.74	17.74	19.74	21.74	23.74	25.74	27.74	29.74	31.74	33.74
	Weight	14.33	16.42	18.50	20.59	22.67	24.76	26.85	28.93	31.02	33.10	35.19
4'-0"	Length	14.41	16.41	18.41	20.41	22.41	24.41	26.41	28.41	30.41	32.41	34.41
	Weight	15.02	17.11	19.20	21.28	23.37	25.45	27.54	29.63	31.72	33.80	35.89
4'-6"	Length	15.07	17.07	19.07	21.07	23.07	25.07	27.07	29.07	31.07	33.07	35.07
	Weight	15.72	17.81	19.89	21.98	24.06	26.15	28.24	30.32	32.41	34.49	36.58
5'-0"	Length	15.74	17.74	19.74	21.74	23.74	25.74	27.74	29.74	31.74	33.74	35.74
	Weight	16.42	18.50	20.59	22.67	24.76	26.85	28.93	31.02	33.10	35.19	37.28
5'-6"	Length	16.41	18.41	20.41	22.41	24.41	26.41	28.41	30.41	32.41	34.41	36.41
	Weight	17.11	19.20	21.28	23.37	25.45	27.54	29.63	31.71	33.80	35.89	37.98
6'-0"	Length	17.07	19.07	21.07	23.07	25.07	27.07	29.07	31.07	33.07	35.07	37.07
	Weight	17.81	19.89	21.98	24.06	26.15	28.24	30.32	32.41	34.49	36.58	38.66
6'-6"	Length	17.74	19.74	21.74	23.74	25.74	27.74	29.74	31.74	33.74	35.74	37.74
	Weight	18.50	20.59	22.67	24.76	26.85	28.93	31.02	33.10	35.19	37.28	39.36
7'-0"	Length	18.41	20.41	22.41	24.41	26.41	28.41	30.41	32.41	34.41	36.41	38.41
	Weight	19.20	21.29	23.37	25.46	27.55	29.63	31.72	33.80	35.89	37.98	40.06
7'-6"	Length	19.07	21.07	23.07	25.07	27.07	29.07	31.07	33.07	35.07	37.07	39.07
	Weight	19.89	21.98	24.06	26.15	28.23	30.32	32.41	34.49	36.58	38.66	40.75





Cap-Double Stirrup Lengths & Weights (#6 bar)

Depth		2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5' - 0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"
Width	Length	13.35	15.35	17.35	19.35	21.35	23.35	25.35	27.35	29.35	31.35	33.35
	Weight	20.05	23.06	26.06	29.06	32.07	35.07	38.08	41.08	44.08	47.09	50.09
3'-0"	Length	14.02	16.02	18.02	20.02	22.02	24.02	26.02	28.02	30.02	32.02	34.02
	Weight	21.06	24.06	27.07	30.07	33.07	36.08	39.08	42.09	45.09	48.09	51.10
3'-6"	Length	14.69	16.69	18.69	20.69	22.69	24.69	26.69	28.69	30.69	32.69	34.69
	Weight	22.06	25.07	28.07	31.08	34.08	37.08	40.09	43.09	46.10	49.10	52.10
4'-0"	Length	15.35	17.35	19.35	21.35	23.35	25.35	27.35	29.35	31.35	33.35	35.35
	Weight	23.06	26.06	29.66	32.07	35.07	38.08	41.08	44.08	47.09	50.09	53.10
4'-6"	Length	16.02	18.02	20.02	22.02	24.02	26.02	28.02	30.02	32.02	34.02	36.02
	Weight	24.06	27.07	30.07	33.07	36.08	39.08	42.09	45.09	48.09	51.10	54.10
5'-0"	Length	16.69	18.69	20.69	22.69	24.69	26.69	28.69	30.69	32.69	34.69	36.69
	Weight	25.07	28.07	31.08	34.08	37.08	40.09	43.09	46.10	49.10	52.10	55.11
5'-6"	Length	17.35	19.35	21.35	23.35	25.35	27.35	29.35	31.35	33.35	35.35	37.35
	Weight	26.06	29.06	32.07	35.07	38.08	41.08	44.08	47.09	50.09	53.10	56.10
6'-0"	Length	18.02	20.02	22.02	24.02	26.02	28.02	30.02	32.02	34.02	36.02	38.02
	Weight	27.07	30.07	33.07	36.08	39.08	42.09	45.09	48.09	51.10	54.10	57.11
6'-6"	Length	18.69	20.69	22.69	24.69	26.69	28.69	30.69	32.69	34.69	36.69	38.69
	Weight	28.07	31.08	34.08	37.08	40.09	43.09	46.10	49.10	52.10	55.11	58.11
7'-0"	Length	19.35	21.35	23.35	25.35	27.35	29.35	31.35	33.35	35.35	37.35	39.35
	Weight	29.06	32.07	35.07	38.08	41.08	44.08	47.09	50.09	53.10	56.10	59.10

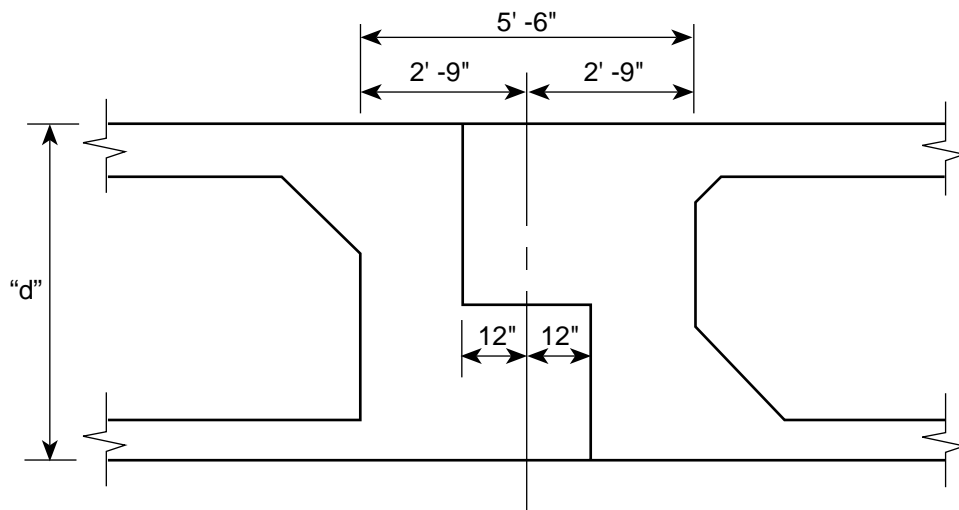




Intermediate Diaphragm Reinforcement

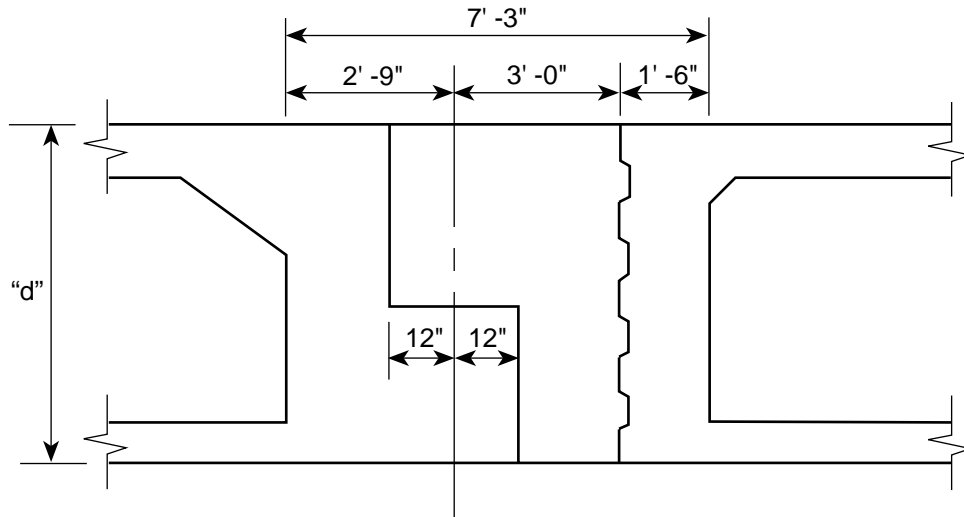
Intermediate Diaphragm Reinforcement- Box Girder or T-Beam (8" width)	
Structure Depth	Lbs./Lf.
3'	22
4'	25
5'	28
6'	32
7'	36
8'	40
9'	44

Hinge Reinforcement



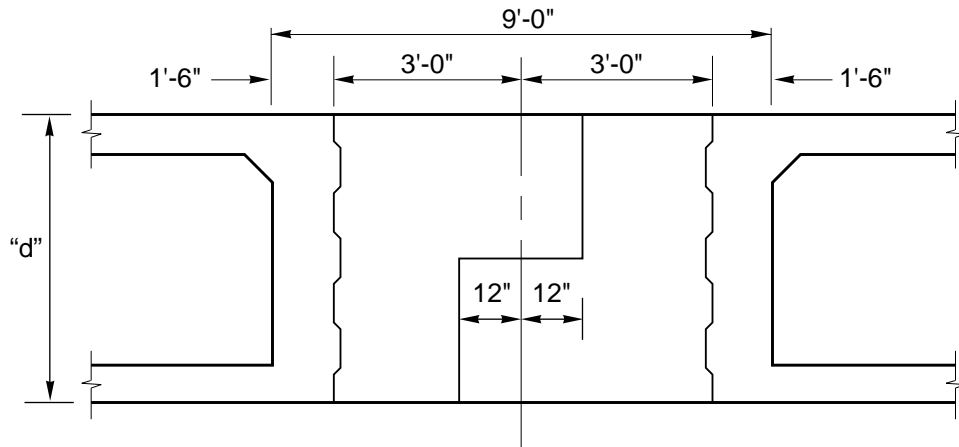
Box Girder 24 in. Hinge-Elastomeric

Structure Depth	Reinforcement Wt./Foot of Length*	Additional Weight/Girder
3'-0"	270#/Ft	+127
4'-0"	290#/Ft	+127
5'-0"	310#/Ft	+127
6'-0"	390#/Ft	+127
7'-0"	410#/Ft	+127
8'-0"	430#/Ft	+127
9'-0"	450#/Ft	+127
10'-0"	470#/Ft	+127
* Out to Out of Exterior Girders		



**Box Girder 24 in. Hinge-Elastomeric
(Prestressed 1 Side)**

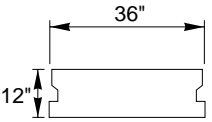
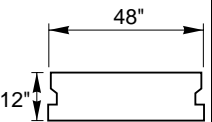
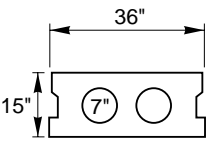
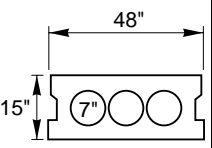
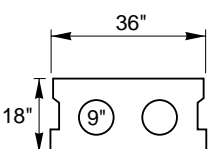
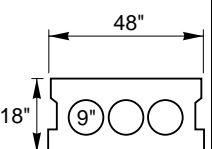
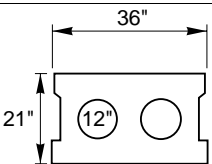
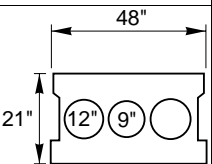
Structure Depth	Reinforcement Wt./Foot of Length*	Additional Weight/Girder
3'-0"	380#/Ft	+127
4'-0"	405#/Ft	+127
5'-0"	430#/Ft	+127
6'-0"	530#/Ft	+127
7'-0"	560#/Ft	+127
8'-0"	590#/Ft	+127
9'-0"	620#/Ft	+127
10'-0"	650#/Ft	+127
* Out to Out of Exterior Girders		



**Box Girder 24 inch Hinge - Elastomeric with Full Closure
(Prestressed Both Sides)**

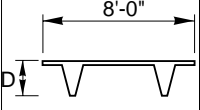
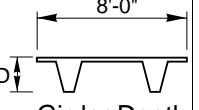
Structure Depth	Reinforcement Wt./Foot of Length*	Additional Weight/Girder
3'-0"	480#/Ft	+127
4'-0"	510#/Ft	+127
5'-0"	540#/Ft	+127
6'-0"	630#/Ft	+127
7'-0"	670#/Ft	+127
8'-0"	710#/Ft	+127
9'-0"	750#/Ft	+127
10'-0"	790#/Ft	+127
* Out to Out of Exterior Girders		

Precast Prestressed Concrete Slab Quantities

36" Width Typical Sections	Girder Length Ft	Pf Kips	No 1/2" Strands	Weight 1/2" Strand Lbs	Weight of Bar Reinf Lbs	Vol of Conc CY	48" Width Typical Sections	Girder Length Ft	Pf Kips	No 1/2" Strands	Weight 1/2" Strand Lbs	Weight of Bar Reinf Lbs	Vol of Conc CY
 SI 36	20	206	11	115	434	2.09	 SI 48	20	275	14	146	585	2.83
	21	226	12	132	451	2.20		21	301	15	165	607	2.97
 SII 36	22	148	8	92	409	2.48	 SII 48	22	194	10	115	550	3.30
	23	162	9	108	421	2.59		23	210	11	132	566	3.45
	24	176	9	113	433	2.70		24	232	12	150	582	3.60
	25	190	10	131	445	2.82		25	251	12	157	599	3.75
	26	205	11	149	457	2.93		26	270	13	176	615	3.90
	27	219	11	155	469	3.04		27	289	14	197	631	4.05
	28	234	12	175	481	3.15		28	309	15	219	647	4.20
	29	250	13	197	493	3.26		29	329	16	242	664	4.35
	30	264	14	219	505	3.38		30	349	17	266	680	4.50
	31	281	15	243	517	3.49		31	370	18	291	696	4.64
	32	296	15	250	529	3.60		32	391	20	334	712	4.79
 SIII 36	33	227	11	190	569	4.19	 SIII 48	33	300	15	258	767	5.53
	34	240	12	213	582	4.32		34	314	16	284	784	5.70
	35	252	12	219	594	4.44		35	331	16	292	801	5.86
	36	267	13	244	607	4.57		36	349	17	319	818	6.03
	37	281	14	270	620	4.69		37	367	18	347	835	6.19
	38	294	14	278	632	4.82		38	385	19	377	852	6.36
	39	311	15	305	645	4.94		39	407	20	407	869	6.52
	40	329	16	334	657	5.07		40	431	21	438	886	6.69
	41	347	17	364	670	5.20		41	454	22	470	903	6.85
 SIV 36	42	273	13	285	705	5.42	 SIV 48	42	367	18	394	950	7.46
	43	288	14	314	718	5.55		43	386	19	426	968	7.63
	44	302	15	344	732	5.67		44	406	20	459	986	7.81
	45	318	16	376	745	5.80		45	426	21	493	1004	7.98
	46	332	16	384	758	5.93		46	446	22	528	1021	8.16
	47	346	17	417	771	6.05		47	465	23	564	1039	8.34
	48	361	18	451	784	6.18		48	488	24	601	1057	8.51

For details see *Bridge Detail Plan XS-12-48*. Quantities based on simple span.

Precast Prestressed Pretensioned Double T Girder Quantities

Type A Typical Section	Girder Length	Pf Ft Kips	No 1/2" Strands	Weight 1/2" Strand Lbs	Weight of Bar Reinf Lbs	Vol of Conc CY	Type B Typical Section	Girder Length	Pf Ft Kips	No 1/2" Strands	Weight 1/2" Strand Lbs	Weight of Bar Reinf Lbs	Vol of Conc CY
 Girder Depth D= 1'-6"	30	290 B	14	221	426	3.28	 Girder Depth D= 1'-6"	30	300 A	14	220	434	3.73
	31	305 B	14	228	438	3.39		31	318 A	14	228	446	3.85
	32	321 B	14	235	450	3.50		32	336 A	14	235	458	3.98
	33	338 B	14	243	462	3.61		33	353 A	16	277	470	4.10
	34	354 B	16	286	474	3.72		34	371 A	16	286	482	4.23
	35	370 B	16	294	486	3.83		35	388 A	16	294	494	4.35
	36	386 B	16	302	498	3.94		36	406 A	18	340	506	4.48
	37	402 C	18	350	510	4.06		37	423 B	18	350	518	4.61
D= 2'-0"	35	251	12	220	526	4.40	D= 2'-0"	35	268	12	221	532	5.16
	36	268	12	226	539	4.53		36	286	12	227	545	5.31
	37	285 A	12	233	552	4.66		37	304	14	272	558	5.46
	38	303 A	14	279	565	4.79		38	318	14	279	571	5.61
	39	320 A	14	286	578	4.90		39	336	14	287	584	5.76
	40	338 A	14	294	591	5.03		40	355	16	336	597	5.91
	41	355 B	16	344	604	5.16		41	374	16	344	610	6.06
	42	373 B	16	353	617	5.29		42	393 A	18	397	623	6.21
	43	390 B	18	406	630	5.41		43	412 A	18	406	636	6.36
	44	408 B	18	415	643	5.54		44	431 A	18	416	649	6.51
	45	425 B	18	425	656	5.67		45	450 A	20	473	662	6.66
D= 2'-8"	44	295	14	323	700	6.59	D= 2'-8"	44	309	14	324	706	7.68
	45	310	14	330	714	6.74		45	325	14	331	720	7.86
	46	325	14	338	728	6.89		46	341	16	386	734	8.04
	47	340 A	14	345	742	7.04		47	357	16	395	748	8.22
	48	355 A	16	403	756	7.19		48	373	16	403	762	8.40
	49	370 A	16	411	770	7.35		49	389	18	463	776	8.57
	50	385 A	16	420	784	7.50		50	405	18	473	790	8.75
	51	400 A	18	482	798	7.65		51	421	18	482	804	8.92
	52	415 A	18	491	812	7.80		52	437	20	546	818	9.10
	53	430 A	18	501	826	7.95		53	453	20	557	832	9.27
	54	445 A	20	567	840	8.10		54	469	20	567	846	9.45
	55	460 B	20	577	854	8.26		55	485 A	22	635	860	9.62
	56	475 B	20	588	868	8.42		56	501 A	22	647	874	9.81
	57	490 B	22	658	882	8.56		57	517 A	22	658	888	9.97
	58	505 B	22	670	896	8.71		58	533 A	24	731	902	10.16
	59	520 B	22	681	910	8.86		59	549 A	24	743	916	10.32
	60	535 B	24	756	924	9.01		60	565 A	24	756	930	10.51
	61	550 B	24	769	938	9.16		61	581 A	26	833	944	10.67
	62	565 B	24	781	952	9.31		62	597 B	26	846	958	10.86
	63	580 C	26	860	966	9.46		63	613 B	26	860	972	11.02

For details see Bridge Detail Plan XS-12-49. Quantities based on simple span.

Notes: A = Concrete stress over 4,000 psi.
 B = Concrete stress over 5,000 psi.
 C = Concrete stress over 6,000 psi.





Precast Prestressed Pretensioned I Girder Quantities

D = 3' - 0"						
Girder Length Ft.	7' 0" SPACING		8' - 0" SPACING		Weight Bar Reinf Lbs	Girder Length Ft.
	Pf Kips	Weight 1/2" strand Lbs	Pf Kips	Weight 1/2" strand Lbs		
50	302	334	336	394	790	50
52	324	375	362	437	803	52
54	347	418	388	482	816	54
56	371	462	415	529	829	56
58	396	509	442	578	842	58
60	422	557	469	630	855	60
62	448	608	498	684	868	62
64	475	661	528	774	881	64
66	502	751	558	831	894	66
68	530	809	588A	893	907	68
70	558A	87C	618A	955	920	70
72	587A	932	650A	1058	933	72
74	616A	996	682A	1128	946	74
76	646B	1102	713B	1195	959	76
78	677A	1171	747B	1310	972	78
80	709B	1245	782B	1385	985	80
82	741B	1375	817B	1505	998	82
84	774B	1455	855C	1585	1011	84
86	807C	1535			1024	86
88					1037	88
90					1050	90
D = 3' - 6"						
50	254	289	284	315	850	50
52	275	328	306	355	865	52
54	295	368	329	397	876	54
56	316	411	352	441	869	56
58	337	457	375	487	902	58
60	359	505	399	536	915	60
62	383	554	424	586	928	62
64	407	605	449	639	941	64
66	430	658	473	693	954	66
68	454	714	500	750	967	68
70	477	772	527	845	980	70
72	503	831	554	907	993	72
74	529	894	582	972	1006	74
76	555	957	610A	1035	1019	76
78	581A	1025	639A	1105	1032	78
80	606A	1093	668A	1215	1045	80
82	639A	1160	698A	1293	1058	82
84	672A	1280	728B	1365	1071	84
86	701B	1360	759B	1445	1084	86
88	730B	1430	791B	1570	1097	88
90	760B	1518	823B	1655	1110	90
D = 4' - 0"						
50	219	257	245	289	910	50
52	235	268	265	300	925	52
54	253	306	285	340	940	54
56	272	347	305	382	955	56
58	292	389	326	427	970	58
60	312	403	347	473	985	60
62	332	448	369	521	1000	62
64	352	496	391	572	1015	64
66	373	546	414	624	1030	66
68	394	598	437	678	1045	68
70	415	652	460	735	1060	70
72	436	708	484	795	1075	72
74	458	767	509	855	1090	74
76	481	827	533	916	1105	76
78	505	900	559	983	1120	78
80	530	955	585	1050	1135	80
82	560	1030	612	1120	1150	82
84	589A	1105	639A	1190	1165	84
86	614A	1175	666A	1265	1180	86
88	640A	1250	693A	1385	1195	88
90	667A	1325	721A	1465	1210	90

D = 4'-6"						
Girder Length Ft.	7' 0" SPACING		8' - 0" SPACING		Weight Bar Reinf Lbs	Girder Length Ft.
	Pf Kips	Weight 1/2" strand Lbs	Pf Kips	Weight 1/2" strand Lbs		
60	276	378	318	441	1000	60
65	323	478	371	545	1035	65
70	370	588	425	660	1070	70
75	422	709	483	827	1105	75
80	474	840	542	965	1140	80
85	535	1028	605	1160	1175	85
90	596	1180	670A	1370	1210	90
95	659A	1400	739A	1600	1245	95
100	722A	1628	810B	1840	1280	100
105	790B	1870	884B	2095	1315	105
110	858B	2140	961C	2370	1350	110
115	931C	2415			1385	115
D = 5'-0"						
60	256	341	284	378	1050	60
65	295	436	332	478	1088	65
70	340	543	381	587	1126	70
75	390	660	434	749	1164	75
80	442	788	488	881	1202	80
85	496	925	546	1025	1240	85
90	553	1122	605	1230	1278	90
95	611A	1283	668A	1400	1316	95
100	670A	1508	732A	1630	1354	100
105	735A	1693	800B	1875	1392	105
110	800B	1948	870B	2140	1430	110
115	866B	2215	943C	2420	1468	115
120	936C	2500	1018C	2710	1506	120
D = 5' - 6"						
60	231	316	256	347	1110	60
65	272	409	301	443	1150	65
70	313	478	346	551	1190	70
75	359	590	395	670	1230	75
80	405	715	444	798	1270	80
85	455	892	498	936	1310	85
90	505	1040	553	1135	1350	90
95	560	1195	611	1300	1390	95
100	614	1365	670A	1525	1430	100
105	673A	1600	732A	1710	1470	105
110	732A	1790	797A	1965	1510	110
115	796B	2050	864B	2240	1550	115
120	859B	2330	934B	2520	1590	120
125	928C	2625	1006C	2820	1620	125
130	996C	2930			1670	130
D = 6'-0"						
60	210	279	233	315	1160	60
65	245	370	274	410	1200	65
70	285	435	316	514	1240	70
75	325	544	362	630	1280	75
80	370	664	408	755	1320	80
85	415	793	458	890	1360	85
90	465	935	509	1040	1400	90
95	515	1085	564	1200	1440	95
100	565	1248	619	1365	1480	100
105	620	1420	678	1600	1520	105
110	675A	1660	737A	1850	1560	110
115	735A	1855	800A	2055	1600	115
120	795A	2120	865B	2335	1640	120
125	860B	2410	932B	2620	1680	125
130	925C	2640	1001B	2940	1720	130

For details see Bridge Detail Plan XS-12-36. Quantities based on simple span.

Notes:

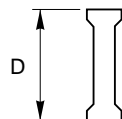
- A Concrete stress over 4,000 psi
- B " " " 5,000 psi
- C " " " 6,000 psi

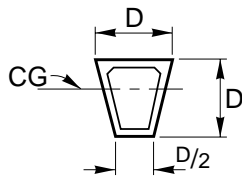
$f_s' = 270$ ksi

$P_f = 23.55$ kips per 1/2" strand

X = 4" (to D= 4'-0") 6" deck thickness

X = 5" (D= 4'-6" to 6'-0") 6 1/4" deck thickness





Prestressed Trapezoidal Box Girder

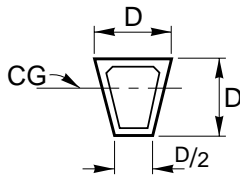
* = f'_c over 6000 psi

D = 4'-0"							
Girder Length Ft.	8'-0" SPACING		10'-0" SPACING		Weight Bar Reinf. Lbs.	Vol. Conc. C.Y.	Girder Length Ft.
	Pf Kips.	Weight $\frac{1}{2}$ " Strand Lbs.	Pf Kips.	Weight $\frac{1}{2}$ " Strand Lbs.			
80	1069	1852	1124	1947	3616	21.75	80
90	1323	2579	1394*	2717	3979	24.34	90
100	1611	3489	1701*	3684	4320	26.91	100

D = 5'-0"									
Girder Length Ft.	8'-0" SPACING		10'-0" SPACING		12'-0" SPACING		Weight Bar Reinf. Lbs.	Vol. Conc. C.Y.	Girder Length Ft.
	Pf Kips.	Weight $\frac{1}{2}$ " Strand Lbs.	Pf Kips.	Weight $\frac{1}{2}$ " Strand Lbs.	Pf Kips.	Weight $\frac{1}{2}$ " Strand Lbs.			
90	1078	2101	1138	2218	1204	2347	4732	31.76	90
100	1295	2804	1373	2973	1456	3153	5138	35.08	100
110	1532	3649	1631	3885	1731*	4124	5545	38.39	110
120	1793	4660	1914	4974	2031*	5278	5950	41.70	120
130	2077	5847	2231	6281	2388*	6723	6356	45.02	130

D = 6' -0"									
Girder Length Ft.	10' - 0" SPACING		12' - 0" SPACING		14' - 0" SPACING		Weight Bar Reinf. Lbs.	Vol. Conc. C.Y.	Girder Length Ft.
	Pf Kips.	Weight $\frac{1}{2}$ " Strand Lbs.	Pf Kips.	Weight $\frac{1}{2}$ " Strand Lbs.	Pf Kips.	Weight $\frac{1}{2}$ " Strand Lbs.			
100	1243	2692	1306	2828	1373	2973	5635	44.20	100
110	1477	3518	1551	3695	1635	3895	6104	48.26	110
120	1734	4506	1829	4753	1925	5003	6573	50.36	120
130	2006	5647	2121*	5971	2243*	6315	7042	54.42	130
140	2320	7034	2453*	7437	2588*	7846	7512	58.49	140
150	2657	8631	2838*	9219	2932*	9524	7980	62.55	150
160	3024	10,478	3175*	11,001	3325*	11,521	8450	66.61	160

Quantities based on simple span



Prestressed Trapezoidal Box Girder

* = f'_c over 6000 psi

D = 7'-0"									
Girder Length Ft.	10' - 0" Spacing		12' - 0" Spacing		14' - 0" Spacing		Weight Bar Reinf. Lbs.	Vol. Conc. C.Y.	Girder Length Ft.
	Pf Kips.	Weight 1/2" Strand Lbs.	Pf Kips.	Weight 1/2" Strand Lbs.	Pf Kips.	Weight 1/2" Strand Lbs.			
110	1403	3342	1483	3533	1564	3726	6994	58.60	110
120	1648	4283	1745	4535	1838	4776	7532	63.42	120
130	1912	5383	2026	5704	2133	6005	8070	68.23	130
140	2183	6619	2338	7088	2475*	7504	8608	73.04	140
150	2517	8176	2668	8667	2849*	9255	9147	77.86	150
160	2857	9899	3035	10516	3192*	11060	9685	82.67	160
170	3202	11788	3409	12550	3582*	13187	10220	87.48	170
180	3587	13982	3771	14700	3960*	15436	10760	92.28	180

D = 8' - 0"									
Girder Length Ft.	12'-0" Spacing		14'-0" Spacing		16'-0" Spacing		Weight Bar Reinf. Lbs.	Vol. Conc. C. Y.	Girder Length Ft.
	Pf Kips	Weight 1/2" Strand Lbs.	Pf Kips.	Weight 1/2" Strand Lbs.	Pf Kips.	Weight 1/2" Strand Lbs.			
120	1662	4319	1761	4576	1861	4836	9295	74.43	120
130	1930	5434	2047	5763	2160	6081	8847	80.00	130
140	2197	6661	2361	7158	2499	7577	9399	85.56	140
150	2544	8264	2699	8767	2865	9307	9950	91.13	150
160	2883	9990	3058	10596	3220	11157	10503	96.70	160
170	3257	11991	3435*	12646	3612*	13298	11055	102.27	170
180	3608	14064	3809*	14848	3992*	15501	11607	107.84	180
190	3974	16352	4182*	17207	4387*	18051	12160	113.40	190
200	4353	18854	4581*	19841	4803*	20803	12710	124.56	200
210	4742	21566	4992*	22702	5224*	23758	13263	130.12	210

Quantities based on simple span



Sources of Quantities for Standard Details

SP = Standard Plans

BDD = *Bridge Design Details*

BDA = *Bridge Design Aids*

Concrete and Reinforcing:

Retaining Wall, Type 1

SP B3-1 and B3-2

Cantilever Abutments

BDD 6-51 and 6-53

Strutted Abutments

BDD-20-10

Cantilever Wingwalls

BDD 20-30 and 20-31

Standard Slab Bridges

BDA 4-11 through 4-20

Steel:

Reinforcing Bar Weights

Appendix

Welded Wire Fabric

Appendix

Piling Patterns – Retaining Walls

BDD 6-60 through 6-62

Piling Patterns – Cantilever Abutment

BDD 6-53

Railroad Track, Ballast, etc.

BDD, Section 12

Commonly Used Quantities and Factors

Access Door to Cellular Abutment 2 ft × 4 ft, Standard Plan B0-13, 125 lbs.

Area Drain, Standard Plan B7-5, 11 lbs.

Asphalt Concrete 150 lbs. per CF

Baled Straw 20 lbs. per CF

Batter Factors:

1:3 = 1.0541 1:5 = 1.0198

1:4 = 1.0308 1:6 = 1.0138

Deck Drain Type C, 310 lbs., Frame and Grate only

Deck Drain Type D-1, 145 lbs.

Deck Drain Type D-2, 124 lbs.

Deck Drain Type A, 17 lbs., Grate only



Drain Pipe, Six Inch (0.135 in.) – 8.65 Lbs./Ft.

Epoxy Adhesive Bond Coat, 1 Gal. per 20 SQFT

Equalizing Bolt @ Hinge – 45 lbs., Miscellaneous Metal (Bridge) (4 ft Hinge Width)

Galvanizing, add 3% to weight of metal

Hinge Assembly, Standard Slab 1 ft Depth, 190 lbs. per FT

Ladder Rung, 6 lbs. each (For MHs, catch basins, etc.)

Manhole Frame and Cover-Deck (Detail U45) 435 lbs.

Manhole Frame and Cover Sidewalk (Detail U46) 235 lbs.

Prestressing Steel – See Item Description

Reinforcing Steel Weights – See Appendix

Rock Base Material, RR Ballast, 120 lbs. per CF

Slurry Leveling Course, 1 Gal. per 100 SQFT

Steel: 0.2833 lbs. per cubic in., 490 lbs. per CF

Earthquake Restrainers – Commonly Used Weights for Miscellaneous Metal

Swage fitting w/stud, nut, and jam nut	5.4 LB each
PL 2 in. × 10 in. × 0 ft-10 in.	57.0 LB each
Cable Drum – Type C-1	39.0 LB each
1 in. Nut	0.3 LB each
¾ in. Galvanized Strand	1.04 LB/LF (1.01 Ungalvanized)
1 ¼ in. H.S. Rod	4.39 LB/LF
1 in. Stud	2.70 LB/LF
PL 1 in. × 5 in.	17.00 LB/LF
Galvanizing and welds	Add 3%



Miscellaneous Metal - Bolts, Nuts, Washers

Machine Bolts*

Diam.	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"	1 1/4"	1 3/8"	1 1/2"	1 3/4"	2"
Length	lbs.	lbs.	bs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1 1/2"	21	35	54	84	118						
2"	24	41	61	93	129						
2 1/2"	27	46	68	102	140						
3"	30	51	75	111	151	211	271	359	438	656	919
3 1/2"	33	56	82	120	163	226	290	381	465	692	966
4"	36	60	88	129	174	241	308	403	491	728	1012
4 1/2"	39	65	95	138	186	256	326	425	517	764	1059
5"	42	69	101	147	198	270	344	447	543	799	1106
5 1/2"	45	744	108	156	210	285	363	469	570 ?	835	1153
6"	47	78	114	165	221	300	381	492	596?	871	1199
6 1/2"	50	83	121	174	233	315	399	514	623	907	1246
7"	53	87	128	183	245	329	417	536	649	942	1293
7 1/2"	56	92	135	192	257	344	436	558	675	978	1340
8"	59	97	141	200	268	359	454	580	701	1014	1386
9"	65	106	154	218	291	388	490	624	754	1086	1480
10"	71	115	167	236	315	418	527	668	807	1157	1573
11"	77	124	180	254	338	447	563	713	859	1229	1667
12"	82	133	193	272	361	477	600	757	912	1300	1760
13"	88	142	206	290	385	507	636	801	965	1372	1853
14"	94	151	220	308	408	536	673	845	1017	1444	1947
15"	100	160	233	326	432	566	709	889	1070	1515	2040
16"	106	169	246	344	455	595	746	933	1123	1587	2134
17"	111	178	259	361	478	625	782	978	1175	1658	2227
18"	117	188	272	379	502	654	819	1022	1228	1730	2321
19"	123	197	285 ?	397	525	684	865	1066	1281	1802	2414
20"	129	206	298	415	549	714	892	1110	1333	1873	2507
21"	135	215	312	433	572	743	928	1154	1386	1945	2601
22"	141	224	325	461	595	773	965	1199	1439	2016	2694
23"	146	233	338	469	619	802	1001	1243	1491	2088	2788
24"	152	242	351	487	642	832	1038	1287	1544	2160	2881
ADD PER INCH	6	9	13	18	23	30	37	44	53	72	93

Nuts*

American Standard Regular

Bolt Diameter Inches	Square Pounds	Hexagon Pounds	Width Inches	Thickness Inches
3/8	3	2	5/8	21/64
1/2	6	5	13/16	7/16
5/8	11	9	1	35/64
3/4	15	13	1 1/8	21/32
7/8	25	20	1 5/16	49/64
1	35	29	1 1/2	7/8
1 1/8	50	42	1 11/16	1
1 1/4	67	59	1 7/8	13/32
1 3/8	100	79	2 1/16	1 13/64
1 1/2	116	102	2 1/4	1 5/16
1 5/8	159	129	2 7/16	1 27/64
1 3/4	190	162	2 5/8	1 17/32
2	280	241	3	1 3/4

Cut Washers *

Size of Bolt Inches	Outside Diameter Inches	Size of Hole Inches	Thickness Inches	Weight Per 100 Pieces Pounds
3/8	1	7/16	5/64	2
1/2	1 3/8	9/16	7/64	4
5/8	1 3/4	11/16	9/64	8
3/4	2	13/16	5/32	12
7/8	2 1/4	15/16	11/64	16
1	2 1/2	1 1/16	11/64	20
1 1/8	2 3/4	1 1/4	11/64	25
1 1/4	3	1 3/8	11/64	30
1 3/8	3 1/4	1 1/2	3/16	37
1 1/2	3 1/2	1 5/8	3/16	40
1 5/8	3 3/4	1 3/4	3/16	48
1 3/4	4	1 7/8	3/16	53
2	4 1/2	2 1/8	3/16	64

* STANDARD WEIGHT / 100 PIECES

ADD 3% IF GALVANIZED



Item Descriptions and Limits and Methods of Payment

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Description of Contract Items

Bar Reinforcing Steel

Bar Reinforcing Steel (Bridge)

1. Estimate in pounds.

Include:

1. Splices shown on the plans either graphically or tabular. See Appendix for lengths. Where lapped bars are of two sizes, use splice length based on the smaller bar.
2. An additional 2% for lap splices not shown on plans, as shown at bottom of Bar Reinforcing Summary Sheet.
3. Bond and anchorage lengths, see *Bridge Design Details* 13-12, 13-14, 13-18 or consult designer.
4. Bar hooks, use “standard” unless dimensioned otherwise. See Appendix.
5. Dowels, grouted or bonded in drilled holes, except those for concrete barrier railings, and diaphragm bolsters.
6. Reinforcement for Cast-In-Place Concrete piling 24 inches and larger.
7. Reinforcement in anchorages for CIP prestress girders.
8. Longitudinal reinforcement in stirrup hooks of precast girders, see *Bridge Design Details* 14-15 and 14-30.
9. Reinforcement in retaining wall footing steps, see Concrete Quantities for Retaining Wall Type 1, page 11-32.
10. Reinforcement around utility openings. See Standard Plans.
11. Bar chairs shown on plans.
12. Longitudinal bars at edge of deck and under railings.
13. Stirrup reinforcement at abutments, see *Bridge Design Details* 6-24.

Note:

1. When calculating final quantities for standard slab bridges, do not use the approximate tabular data shown on standard sheets.
2. Use the tabular data on the Standard Plans for Retaining Walls. Design “H” value may be exceeded by 6 inches before going to the next larger value.



Do *not* include reinforcement in:

1. Precast members (girders, walls, piling, panels, etc.)

Reinforcing for precast girders is shown on the marginal (final) estimate for use in pricing for nonstandard girders only. For nonstandard girders use 130LB per CY.

2. Cast-In-Place Concrete Piling less than 24 inches
3. Concrete barriers and dowels therefore (Types 25, 26, 27, 50, etc.)
4. Bridge approach slabs
5. Bridge slope paving
6. Diaphragm bolsters for hinge restrainers
7. Hairpins in steel pile anchorages
8. Closure walls
9. Sound walls – precast or masonry block
10. Deck access closure (usually for EQ restrainers)
11. Ripped texture (reinforcement used to create ripped texture)
12. Concrete crib walls
13. Cable anchorages for railings
14. Concrete panels for reinforced earth walls
15. Supply line cradles
16. Concrete classified as “Minor” (Gutters, etc.)
17. Soil Nails
18. Concrete Box culverts
19. Expansion dams

Bar Reinforcing Steel (Epoxy Coated)

1. Estimate in pounds (Add 2% for splices not shown on the plans)
2. The Specifications Engineer must be advised of all locations where epoxy-coated bar reinforcing steel is used.
3. Tabulate the quantity of Bar Reinforcing Steel (Epoxy-Coated) separately, except for reinforcing in concrete barrier railings, pilings less than 24 inches and precast members.
4. Use bar weights the same as for uncoated bars. (No allowance is made for the weight of epoxy.)
5. If any portion of a bar requires epoxy-coating, the entire bar will be coated.



6. Decks and Approach Slabs: In Environmental Area III, and some other corrosive environments, the deck and approach slab reinforcing steel is to be epoxy-coated.

Decks 12 inches thick and less:

Epoxy-coat the entire deck reinforcing.

Decks greater than 12 inches thick:

Refer to *Memo to Designers 8-2*.

In all cases, the reinforcing in abutment, bent and girder diaphragms is to be coated to the same depth as the adjacent deck. See "5" previous page.

7. Concrete Barrier Railings: Epoxy-coated bar reinforcing for railings, including their dowels, is included in the linear foot item for railing. Do not calculate this weight.
8. Concrete Piling: If epoxy-coated bar reinforcing is used for piling less than 24 inches in size, it is included in the linear foot item for piling. For piling 24 inches or larger, calculate the quantity separately and include in the total epoxy-coated bar reinforcing for the structure.
9. Precast Concrete Members (Not Piling): Epoxy-coated bar reinforcing, if used, is included in the per each item for the member. Indicate the amount per unit as an aid to estimating the cost, but do not include in the total.
10. Other Features: Epoxy-coated bar reinforcing for cast-in-place footings, columns, walls, etc. must be calculated separately and included in the total epoxy-coated bar reinforcing for the structure.

Bar Reinforcing Steel (Retaining Wall)

1. Estimate in pounds using Standard Plan values. Tabular values do not include reinforcement in haunch when concrete barrier is attached at top; therefore, this must be added to the tabular values.

Concrete

Seal Course Concrete

1. Estimate in cubic yards to one foot outside neat lines even though it is not shown that way on the plans.
2. This item is for concrete placed under water and is designated on the plans as Seal Course Concrete.
3. See *Bridge Design Details 7-20.1*.



Structural Concrete, Approach Slab

1. Estimate in cubic yards. This includes all new (Type N) structure approach items. On rehabilitation (Type R) projects, separate quantities are needed for drainage, base material, etc.
2. Required only where shown on the plans.
3. See *Memo to Designers* 5-3.

Structural Concrete, Bridge

1. Compute in cubic yards from plan dimensions.
2. Do not deduct for volumes occupied by reinforcing steel, prestressing steel, miscellaneous metal, structural steel, piling, drain pipes or joint filler.
3. Deduct for utility openings.
4. Do not deduct for access openings in soffit.
5. Include bent caps, slab, and diaphragms for precast girder superstructures.

Structural Concrete, Bridge Footing

1. Compute in cubic yards from plan dimensions.
2. Includes all concrete designated on the plans as bridge footing concrete.
3. Do not deduct for reinforcing or piling.

Structural Concrete, Lightweight

1. Estimate in cubic yards to limits shown on the plans, and report separately on Marginal Estimate and Concrete Summary form.

Structural Concrete, Pier Column

1. Estimate in cubic yards to limits shown on the plans.
2. This item is for concrete placed in excavated (mined) shafts.

Structural Concrete, Retaining Wall (Not Bridge Wingwall)

1. Estimate in cubic yards using Standard Plan values. Tabular values do not include portion for haunch when concrete barrier is attached at top; therefore, this must be added to the tabular values.
2. Retaining Walls that have a retaining wall number are not classified as wingwalls and are paid for as Structural Concrete, Retaining Wall.



3. Wingwalls for abutments, even though they consist of lengths of standard retaining walls, will normally be considered as Structural Concrete, Bridge, unless the wingwall is part of a retaining wall that has a retaining wall number.

Slope Paving

1. Estimate the cubic yards of concrete. This pay item will include necessary earthwork and reinforcing steel.
2. Estimate permeable material in cubic yards.
3. Estimate drainage inlets by each.
4. Estimate drain pipes in linear feet for each size and type.

Deck Rehabilitation

Deck Seal Type

Traffic Control System	LS	By District
Remove Unsound Concrete	CF	Use SF from chain survey $\times 0.2$ ft
Remove Deck Surfacing	SQFT	Assumed to be AC
Asphalt Concrete (Type B)	TONS	$CF \times .075 = \text{TONS}$
Include approach taper, usually 100 ft		Includes Prime Coat or Paint Binder
Drill and Bond Dowel	LF	Usually with Exp Dam
Epoxy Adhesive (Bond Coat)	GAL	1 GAL per 20 SF use with PCC patch and PCC exp. dam.
Portland Cement Concrete (Patch)	CF	Usually same quantity as Remove Unsound Concrete
Install Bleeder	EA	Plans must show location
Expansion Dam	CF	Includes reinf. and dowels
Deck Seal	SQFT	$L \times (W + .5)$ includes primer
Slurry Leveling Course	GAL	1 GAL per 100 SF. Use on rough decks only
Joint Seal	LF	Indicate MR
Rapid Setting Concrete (Patch)	CF	
Clean Bridge Deck	SQFT	
Furnish Bridge Deck Treatment (Methacrylate)	GAL	
Treat Bridge Deck (Apply Treatment)	SQFT	

**Dense Concrete Overlay Type**

Traffic Control System	LS	By District
Temporary Railing (Type K)	LF	
Asphalt Concrete (Type B)	TON	For shoulders
Remove Unsound Concrete	CF	
Remove Deck Surfacing	SQFT	Assumed to be AC
Scarify Concrete Surface	SQFT	Include approaches
Deck Overlay (Concrete)	CY	Include approach taper, 70 ft ±
Saw Concrete Joint	LF	
Joint Seal	LF	Indicate MR
Polyester Concrete Overlay		
Furnish Polyester Concrete Overlay	CF	
Place Polyester Concrete Overlay	SQFT	
Rapid Setting Concrete (Deck Overlay)	CF	

Grind Bridge Deck – Existing Deck

1. Paid by extra work and covered by supplemental funds.

Refinish Bridge Deck

1. Estimate by square foot.

Earthquake Restrainers, Retrofit and Repair**Earthquake Restrainers, Retrofit, and Repair**

The usual items are:

Traffic Control System By District

Access Opening, Deck EA

This includes the removal work.

Access Opening, Soffit (For existing structures only) EA

This includes the removal work and the closing steel plate.

Minor Concrete (Minor Structure) CY

This item will cover a variety of abutment blocks, shear blocks, bent blocks, pedestal supports, etc. It includes concrete, bar reinforcing, drill and bond dowels and excavation and backfill if needed. If the total quantity is small, the unit may be cubic feet.



Diaphragm Bolster EA

These are used to reinforce concrete girders. The item includes concrete, bar reinforcing and drill and bond dowels.

Close Access, Deck EA

This includes concrete (any type), bar reinforcing and the temporary steel cover plate.

Core Concrete (each size) LF

Miscellaneous Metal (Restrainer) LB

Include all metal involved in the restrainers. Provide separate estimates for both cables and rods. Deduct for holes. Ignore small non-repetitive copes and cuts. Add 3% for galvanizing and welds.

Tiedown Anchor EA

Includes core concrete through footing.

Asphalt Membrane Waterproofing SQFT

Column Casing (Steel) LB

Includes casing, grout and seal, expanded polyethylene, welding, backup plates, drain extension, and cleaning and painting structural steel. Earthwork separate.

See "Column Casing - Steel" under "Miscellaneous" in this section for Weights for Square Foot.

Drill and Bond Dowel

1. Estimate by linear foot.

Hinge Hold Down (Temporary)

1. Estimate by each.
2. Specify by type – prestress or dead load.

Temporary Support (Existing Superstructure)

1. Estimate by each.
(Provide square foot of supported area.)



Earthwork

Structure Backfill or Structure Backfill (Bridge)

1. Estimate in cubic yards.
2. See Standard Plans for limits of payment.
3. Deduct volume of concrete within the excavation limits, except for crib walls.
4. Deduct pervious and/or permeable material, if any.
5. Compute quantity only at those locations where backfill must be compacted. Compaction of backfill is not required in waterways or channel areas which are not beneath embankments, pavements or slope protection. If uncertain, check with Specifications.
6. There is generally no Structure Backfill quantity to calculate to replace Structure Excavation (Type A).
7. Do not calculate quantity for structure excavation or backfill directly related to bridge removal.

Structure Backfill (Retaining Wall)

1. Estimate in cubic yards.
2. Use when Structural Concrete (Ret. Wall) is required.
3. See Standard Plans for limits of payment.

Structure Excavation or Structure Excavation (Bridge)

1. Estimate in cubic yards.
2. See Standard Plans for limits of payment.
3. When plans require concrete to be placed against undisturbed material, the quantity shall still be calculated with widths one foot outside the concrete dimensions.
4. Where bridge approach embankments are to be surcharged, the placing and removal of excess material will be paid as a separate item.
5. The grading plane may be assumed to be 1 ½' below finished pavement.
6. Where the volumes of Structure Excavation and Remove Concrete overlap:
Case 1. If there is no item of work (on the entire contract) for removing concrete and the amount is minor and lies within the limits of payment for structure excavation, it can be included and paid for as structure excavation. Inform Specifications Engineer.



Case 2. If there is an item for Remove Concrete, either by CY or LS, deduct the volume of concrete only from the structure excavation volume.

Case 3. If there is an item for Bridge Removal, deduct the volume of concrete and related excavation from the structure excavation volume.

In either Case 2 or Case 3, if it would clarify the situation, draw a separate pay limit diagram on the plans.

Structure Excavation (Type A)

1. Estimate in cubic yards.
2. Use where excavation will be below water level.
3. Use only when seal course is shown.
4. Includes backfill of uncompacted native material, except under embankment, pavement, sidewalks, or slope protection

Structure Excavation (Type D)

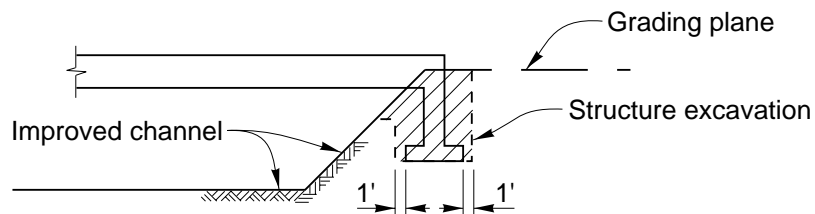
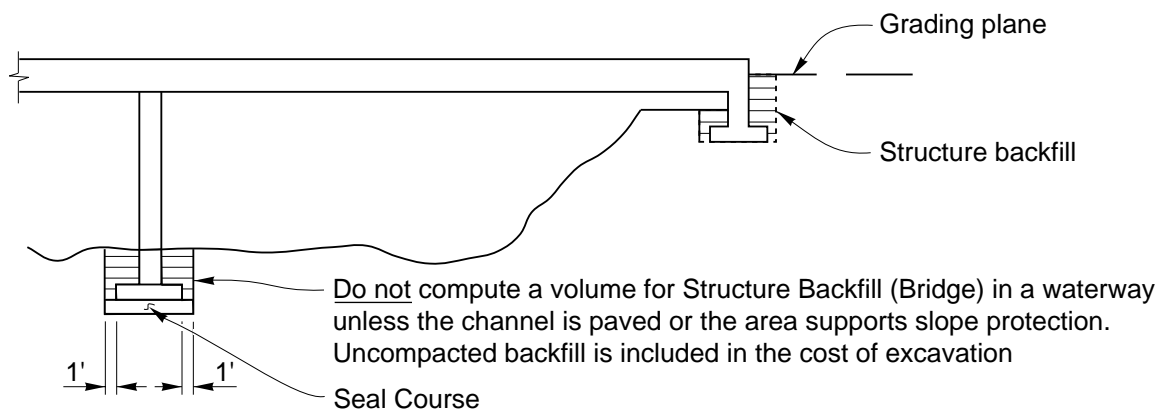
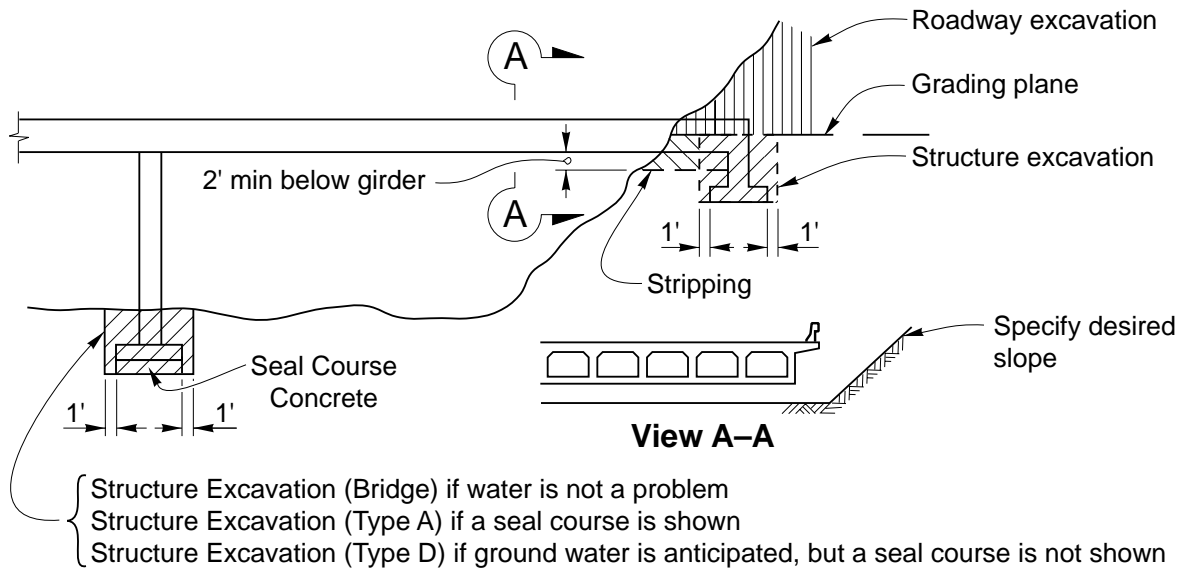
1. Estimate in cubic yards.
2. Use where ground water is anticipated, but a seal course is not shown.
3. In a waterway Structure Excavation (Type D) includes backfill of uncompacted native material, except under embankment, pavement, or slope protection.

Structure Excavation (Retaining Wall)

1. Estimate in cubic yards.
2. Use when Structural Concrete (Ret. Wall) is required.
3. See Standard Plans for limits.



Excavation and Backfill in Waterways





Structure Excavation (Pier Column)

1. Estimate in cubic yards.
2. Use with Structural Concrete (Pier Column)
3. Calculate quantity to 6 inches outside concrete dimensions, see *Bridge Design Details*, Section 7-20.

Pervious or Permeable Backfill Material

1. Estimate in cubic yards.
2. Subtract volume from Structure Backfill.

Roadway Excavation

1. Usually handled by District.
2. Includes excavating channels having bottom widths of 12 feet or more.
3. May include removal of unsuitable foundation material in areas 50' × 12' or more. Check with Specifications Engineer.

Joint Seals

Joint Seal (Type A or AL)

1. Estimate by linear feet.

Joint Seal (Movement Rating 2 Inches or Less)

1. Estimate by linear feet for each MR.
2. See Standard Plan B6-21, for pay limit extension at low side of the deck.

Joint Seal Assembly (Movement Rating More Than 2 Inches)

1. Estimate by linear feet for each MR.
2. See Bridge Standard Detail Sheet XS-12-59, for pay limit extension at the low side of the deck.



Pay Limits – Joint Seal at Abutments

The pay limit for joint seals at abutments are dependent on the type of abutment and type of approach slab.

End Diaphragm Abutments

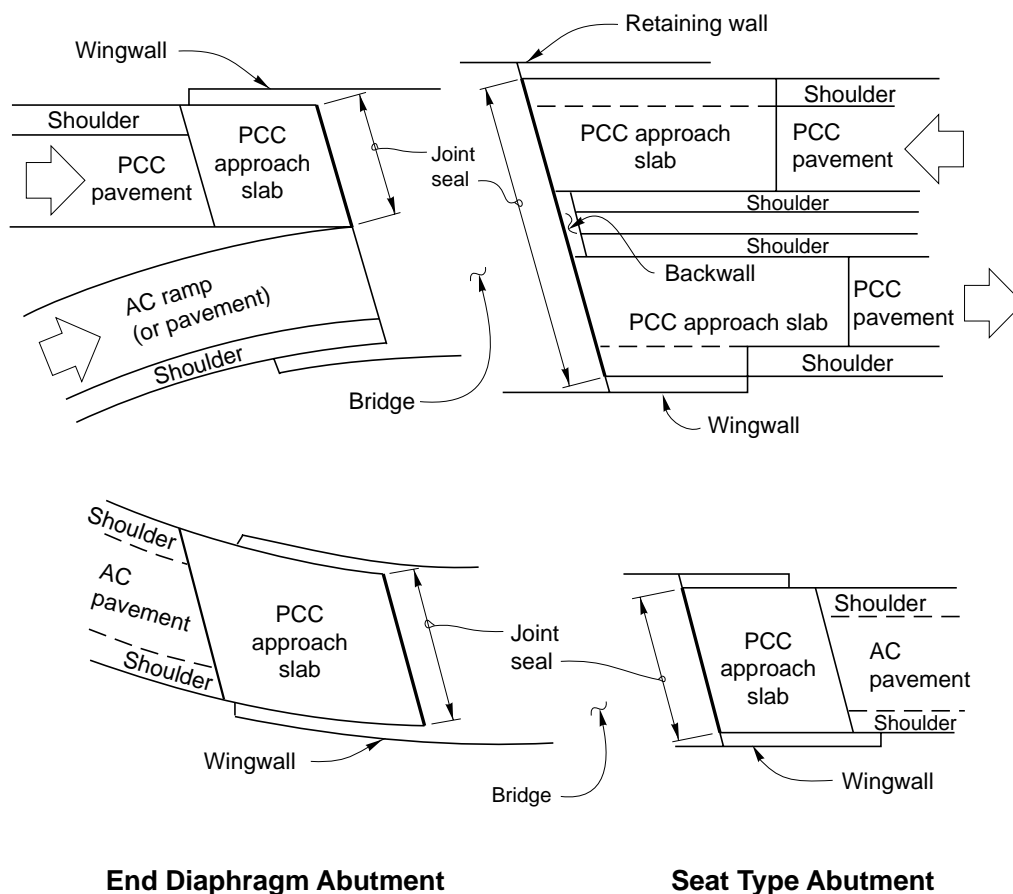
Joint seal is used only with PCC approach slabs. The pay length of the joint seal where required is the actual distance along the end of the PCC approach slab resting on the paving notch (plus extensions at the concrete barrier.) There are no joint seals in median areas, median shoulders, and AC ramps at the abutments that do not have approach slabs.

Joint seal between sleeper slab and approach slab of Structure Approach (N45) is included in cost of structure approach. Do not include in estimate.

Seat Type Abutments

The pay length of the joint seal is the total distance between concrete barriers (plus extensions into them). Sections of the backwall that do not receive an approach slab must be constructed to the finished roadway grade.

(See Standard Drawings for Structure Approach Slab Details and Joint Seals.)





Metal

Miscellaneous Metal (Bridge)

1. Estimate in pounds, add 3% if galvanized.
2. The Standard Specifications (75-1.03) list the following to be paid as Miscellaneous Metal (Bridge). There may be other items.

Bearings in Concrete Structures	Guard Posts
Equalizing Bolts	Access Opening Doors (new structures)
Expansion Joint Armor	Deck Drains
Manhole Frame and Cover	Retaining Wall Drains
Grates	Area Drains
Ladder Rungs	Drain Pipes

3. Miscellaneous metal in connection with prestressing, such as anchorages, saddles, ducts, etc., are not paid as this item. They are included in Prestressing CIP Concrete.
4. Estimate manhole frame and covers when they are to be paid for by the State. Sometimes they are furnished to the contractor by the utility company.
5. See also Bridge Drainage System.
6. Do not calculate weight for access opening plates. They are included in the cost of concrete for new construction and in the cost of Soffit Access Openings for existing structures.

Miscellaneous Metal (Restrainers)

1. These are earthquake restrainers. Estimate total weight in pounds, add 3% for galvanizing and welds.
2. See also Quantity Take-Off for Earthquake Restrainers, Retrofit and Repair.

Piling

Furnish Piling

1. Length in linear feet is from specified tip to cut-off elevation inside the footing or cap. Batter piles are measured along the slope of the long side. For large diameter batter piles, a diagram should be shown on the plans for clarification.
2. A separate item is required for each type or class of piling.
3. Prior to a Foundation Recommendation, and unless better information is available, estimate a 40 foot length for bridges and 15 feet for sound walls.



Drive Piles

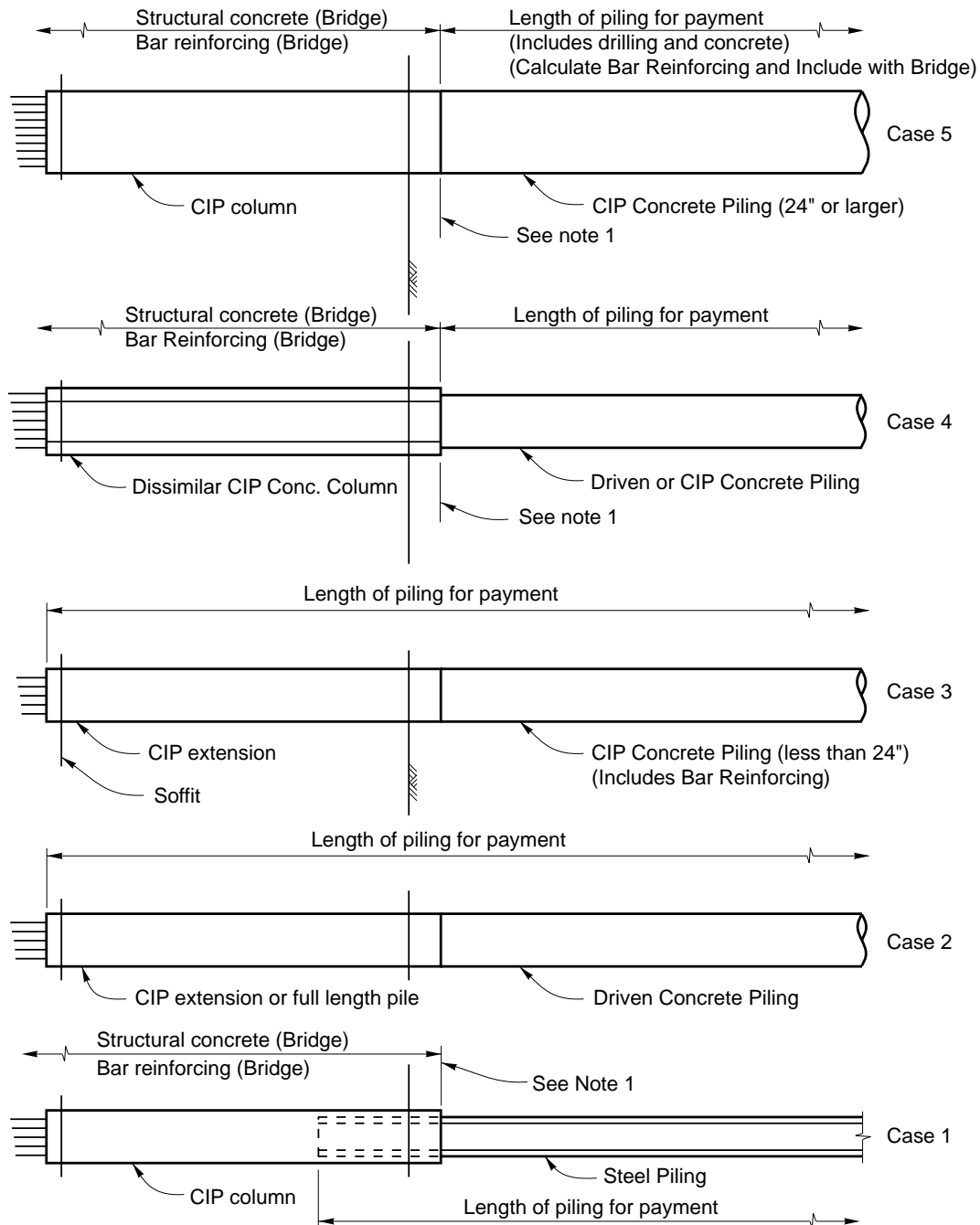
1. Estimate by each, for each type or class.

Cast-in-Place Concrete Piling (Includes CIDH Piling)

1. Length in linear feet is from specified tip to the “cut-off” elevation or top of pile extension.
2. For piles less than 24 inches, the price of the pile includes the bar reinforcing.
3. For piles 24 inches and larger, compute the weight of bar reinforcing and include with Bar Reinforcing Steel (Bridge).



Pile Extensions and Columns



- Note: 1. Case 1, 4, and 5 must have a pile cut-off elevation.
2. The extension may or may not have the same reinforcing as the pile.
3. Indicate the pay limits shown on plans.
4. Estimate pile length to specified tip elevation.



Pipes, Conduits, Drains

Bridge Drainage System

1. Estimate in pounds of steel.
2. Include inlets, pipes, supports, etc.
3. Add 3% to weight for galvanized portions.
4. Not paid as Miscellaneous Metal (Bridge)

Drains and Miscellaneous Pipes

1. Estimate by linear feet for each size and type. Indicate thickness for steel pipes, and class for pressure rating for asbestos and PVC pipes.

Sprinkler Control Conduit and Communication Conduit

1. Usually a District Item. Design may be asked to calculate length through structure for transmittal to District.
2. See Standard Plan B14-3.

Supply Line Bridge

1. Estimate by linear feet for each size. Estimate to 5 feet beyond wingwall, see Standard Plan B14-3. The payment per foot of pipe includes hangers, supports, brackets, and expansion details.
2. Do not calculate weight for Access Opening Plates for supply lines. They are included in cost of concrete.
3. Plan Sheet from the Mechanical Design Section must be included with Bridge Plans for all sizes.

Precast Girders

Furnish Precast Concrete Girders

1. Estimate by each and separate by nominal lengths.
2. List conventionally reinforced and prestressed girders separately.
3. Indicate concrete, bar reinforcing steel and prestressing quantities for each nonstandard girder. Show this information at the bottom of the Marginal Estimate form.

Erect Precast Concrete Girder

1. Estimate by each for each length.



Prestressing Steel

Prestressing Cast-in-Place Concrete

1. The contract item is Prestressing Cast-in-Place Concrete, and includes placing ducts, prestressing steel, stressing, anchorages and grouting. The concrete cover over end anchorages and reinforcing is paid for as Structural Concrete (Bridge) and Bar Reinforcing Steel (Bridge).
2. Estimate in pounds, do not include anchorages, ducts, etc.
3. Weight:

$$\frac{P_f \times \text{Length} \times 3.4}{157} = \text{LBS}$$

$$\frac{P_{\text{jack}} \times \text{Length} \times 3.4}{202.5} = \text{LBS}$$

P_f or P_{jack} in Kips

Length in feet

For RR loading add 7.5%

Railings and Barriers

Concrete Barriers

1. These are Types 25, 26, 27, 50, etc.
2. Estimate by linear feet. This includes the reinforcing and dowels and any earthwork for Types 25B, 26A, etc.
3. Drill and bond dowels for rail replacement is included in the price per linear foot.

Metal Railing

1. These are usually steel railings such as tubular hand railing, chain link railing, cable railing, Types 18, 115, 116, 117, etc.
2. Estimate by linear feet. This includes anchor bolts or post pockets.

Temporary Railing

1. Estimate by linear feet for locations shown on the plans or required for falsework openings. Type K should be in 20 foot increments.
2. The total length for payment includes the lengths each time it is used at (or moved to) a new location.



Structural Steel

Furnish and Erect Structural Steel (Bridge)

1. Segregate by type of steel and estimate in pounds.
2. Include bearings (except PTFE Spherical Bearings), anchor bolts, shear connectors, and expansion dams (except where expansion dams are galvanized or embedded in concrete).
3. Ignore small, non-repetitive cuts and copes.
4. Add 3% for welds.

Clean and Paint Structural Steel

1. Paid by lump sum.
2. Estimate by square feet of area to be painted.

Structural Steel Plate Pipes and Arches (Super Span)

1. These are paid by the linear foot which includes excavation, backfill, shaped bedding, thrust beam and sometimes concrete footings.
2. For pricing purposes, it is necessary to calculate the total pounds of steel, quantities in the thrust beam, and approximate cubic yards of excavation and backfill. See Standard Plan A62-F for earthwork limits.
3. For the arch portion, calculate the concrete and reinforcing for the footings (and invert, if any) and report separately.
4. Calculate the excavation, backfill, concrete and reinforcing in the headwalls, cut-off walls, and wingwalls and report separately.

Walls

Closure Walls

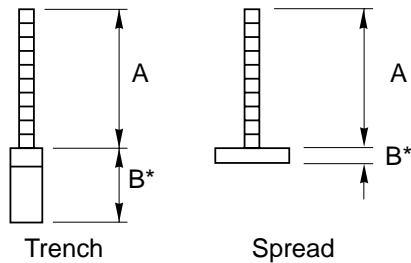
1. Estimate by square foot.
2. Specify alternative(s) if all three are not allowed.
3. Do not include a separate item for architectural treatment. Included in the cost per square foot of wall.

Mechanically Stabilized Earth Walls – MSE

1. Estimate by square foot.
2. Includes excavation, backfill, etc.

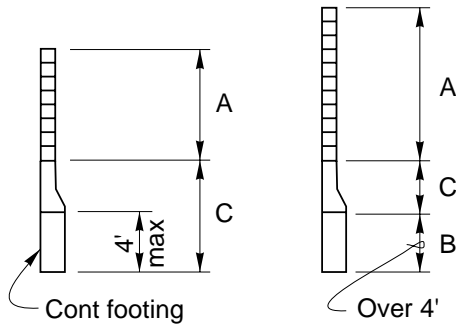


Sound Walls



Trench

Spread

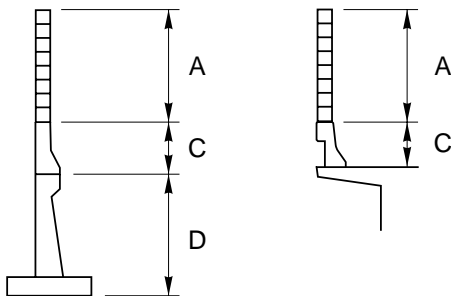


Cont footing

Case 1

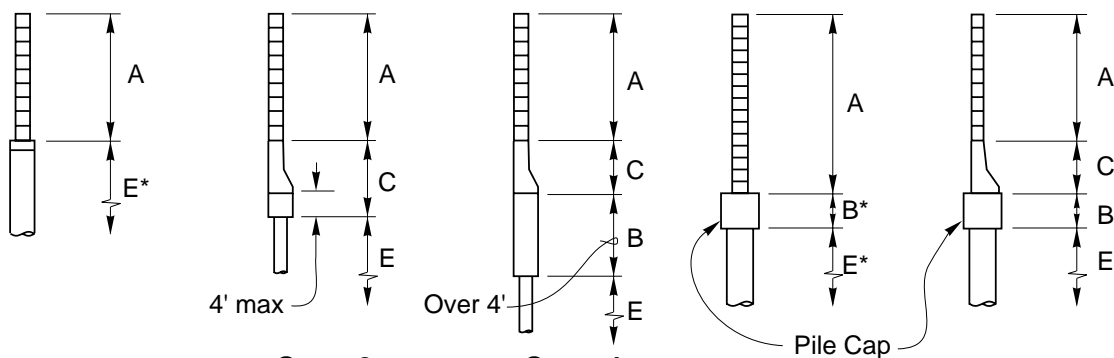
Case 2

If wall is both Case 1 and 2, use Case 2



Retaining Wall

Bridge



Case 3

Case 4

If wall is both Case 3 and 4, use Case 4

* These are not separate items

- A. SQFT of wall, indicate each type.**
- B. CY Minor Concrete (Minor Structure), includes excavation, backfill & reinforcing
- C. LF Concrete Barrier (indicate type).
- D. Usual retaining wall quantities.
- E. LF CIDH concrete piling, indicate size.
- F. LF of special wall cap if used.

** Usual types

8x8x16 plain concrete blocks

8x8x16 split face, one side or both

Precast concrete panels

Indicate stacked bond or running bond

Indicate color or other architectural treatment

If the soundwall is sitting on a retaining wall or concrete barrier, all the support items are paid for separately. If a sound wall is sitting on anything else, everything is included in the square foot price of the sound wall.



Miscellaneous

Architectural Treatment

1. Estimate by square foot of area of each type to be treated.
2. Architectural treatment for closure walls is included in square foot cost of wall.

Asphalt Concrete

1. Estimate by ton. (150 lbs per CF)
2. Use Type B for overlays on concrete bridge decks.
3. If the roadwork also has AC (Type B), contact the District Designer to see if they will include the quantity in their estimate. If so, note this on the Marginal Estimate Form.

Asphalt Membrane Waterproofing

1. Estimate by square foot for area delineated on plans.
2. This is for underground use, not as a deck seal.

Bridge Removal and Bridge Removal (Portion)

1. Usually paid as a lump sum.
2. Indicate square feet of deck area, and type of bridge.
3. For Bridge Removal (Portion) give estimate of cubic yards of concrete.
4. Unless noted otherwise, removal will be to three feet below finished grade.
5. Includes excavation and backfill directly associated with removal.

Column Casing – Steel

1. Estimate in pounds.
2. Weight per square foot of various thicknesses
 - $\frac{3}{8}$ inch = 15.4 psf of column casing
 - $\frac{1}{2}$ inch = 20.6 psf of column casing
 - $\frac{5}{8}$ inch = 25.7 psf of column casing
 - $\frac{3}{4}$ inch = 30.9 psf of column casing
 - 1 inch = 40.8 psf of column casing



Core Holes

1. Estimate by linear feet for each size shown.

Crash Cushion

1. Estimate by each.
2. Specify type of crash cushion required.

Deck Seal

1. Estimate by square foot. Use distance between rails plus 5 inches above finished surface at each rail face. This is for a membrane seal.
2. See also Quantity Take Off for Deck Rehabilitation.
3. Also need item for clean deck, in square feet, on Deck Rehabilitation projects.

PTFE Bearings

1. Estimate by each for concrete structures.
2. Estimate by pounds of structural steel for steel structures.
3. Multiple discs in a bearing assembly count as a single unit.

Railroad Work

1. Rail – LF (A track foot includes both rails)
2. Ties – EA
3. Ballast – TONS
4. Waterproofing and cover – SQ FT

Remove Concrete

1. Estimate in cubic yards. Concrete will be removed to a depth of three feet below finished grade unless shown otherwise.
2. See also Structure Excavation.

Rock Slope Protection

1. Usually District item – check with District Project Engineer.
2. Estimate in cubic yards. Specify size of rock.
3. Item includes necessary excavation, etc.



Soil Nails

1. Estimate by linear feet.

Tieback Anchors

1. Estimate by each.

Timber

1. Estimate by MFBM (Thousand Feet Board Measure). One foot board measure is 144 cubic inches. Use nominal sizes and do not deduct for bevels or daps.
2. Do not estimate hardware such as nails, lag bolts, washers, etc.
3. Estimate Structural Metal, such as shapes, castings, eyebars, etc., by the pound and report separately.
4. Estimate treated and untreated separately.
5. Estimate timber catwalks by linear feet.